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Business Equipment Manufacturers Association
DPG Engineering Committee
235 East 42nd Street
New York 17, New York

Gentlemen:

All of the members of our industry have been working diligently for some time in an endeavor to develop a standard code for our industry. The advantages are obvious, particularly if it can be achieved in a sensible and non-disruptive manner.

There is a specific cost to the users in changing systems from existing codes to a standard code. To the degree that this cost can be minimized, then acceptance by the users will be expedited and the purpose of standardization achieved.

The proposed X3. 2 Code has little relationship to most of the codes in use today. It appears to be sound and only time will prove its efficiency. Its incompatibility with existing codes is its major question.

We have always felt that if the standard code could be a derivative of existing codes the cost of transition to thousands of users would be less. To this end, we have developed a code which fulfills all the requirements of a standard code, yet which is related to existing codes in the users' offices. We therefore believe that the cost of transition would be less and hence the code would be accepted by the user more quickly.

Before our Association arrives at a decision on the presently suggested code, we invite your attention to the derivative code attached. We strongly urge that the cost factors involved in a transition be identified and made known to the user groups. They should have a complete picture of the possible variations in cost between the two approaches to standardization.

Very truly yours,

W E Andrus Jr

W. E. Andrus, Jr.
Group Director of Standards

WEA, Jr/ep
Attachment

cc: Mr. C. A. Phillips = with attachment

NMAH 310/3

# THE CONSTRUCTION OF 8-BIT CODED-CHARACTER SETS

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## INTRODUCTION

The following four properties desirable in a CPU coded-character set will be described and discussed:

a) Binary collatability
b) Separability of character types
c) Compatability
d) Subsetability

These four properties are described as follows:

> Binary collatability: If a prescribed collating sequence is directly embodied in the bit code sequence, the set is said to have binary collatability.
>
> Separability of character types: If character types, such as Controls, Specials, Alphabetics, Numerics are grouped so that a character type is identified by its high order bits, the set is said to have separability.
>
> Compatability: If the graphics of a set have card-codes and bit-codes such that a negligible or no translation is necessary to the BCD Interchange Code, the set is said to have compatability.
>
> Subsetability: If useful subsets are obtainable by simple logical operations on the bits, the set is said to have subsetability.

An 8-bit CPU character set will be described, and the extent to which it has the above properties examined.

# BINARY COLLATABILITY

The ability to sort non-numerical information is required of most computers. The obvious application of sorting records enters into most commercial processing. In assembling and compiling, alphameric variables are sorted into lists for reference purposes in other phases of the compiling and assembling process. CPU sorting makes up a substantial portion of the computing load in both commercial and scientific installations.

Generally, the basic CPU sorting process involves a comparison instruction of some kind. The instruction takes two "numbers" (words, fields, characters), e.g.; A and B, which can be alphameric, and asks the question, "Is A greater than, equal to, or less than B?". In binary computers, the comparison instruction is essentially a subtraction operation. B is subtracted from A, the numeric result is (generally) not generated, but the sign of the result, plus, minus, or zero is generated. An examination of the sign of the result determines the required comparison.

The preponderant collating sequence in the data processing world is defined in conjunction with the Standard BCD Interchange Code. Essentially, it prescribes a "gross" collating sequence of Specials, Alphabet, Digits: that is, Specials collate low to Alphabet and Digits, and the Alphabet collates low to the Digits.

It is interesting to note that the collating sequence of the Standard BCD Interchange Code is not embodied in the bit-codes assigned to the characters. For example, the bit code for the digit "9" is 001001, and the bit code for the letter "A" is 110001. On a binary comparison, 9 is less than A, but the collating sequence prescribes that A is less than 9.

This anomaly has been resolved, in the past, in two ways. First, for character machines, the collating sequence is achieved by a hardware comparator. The simple subtraction process previously described will not work. Second, in binary machines, characters to be collated are first translated into characters which will yield the prescribed collating sequence, then the simple subtraction process is applied. This process of translation before comparison has been called a "software comparator."

What are the implications of comparators to a computer user? While it must be recognized that this is only one of the factors in the choice of a CPU code, these points apply. First, if he has a CPU with a comparator, his comparator cost is relatively insignificant in the cost of a large scale CPU, but it is greater relative cost for small scale CPU's, such as are used in off-line peripheral operations. It is in small scale CPU's that a major design-objective is low-absolute costs, in comparison, relatively, to the objective of low cost per unit of work. Second, if he has a large scale, binary CPU, the software comparator is a cost to the user in CPU time. Increased processing time grows more significant as available computer time is more heavily saturated.

It is possible to develop an extended character (ECS) which embodies the collating sequence directly in the bit-code, so that the simple binary subtraction process is available, thus reducing both hardware and software costs. If an ECS has such a property, it has the property called "binary collatability".

# SEPARABILITY OF CHARACTER TYPES

Characters in a coded-character set are generally grouped into four types: Controls, Specials, Alphabet, Digits. The ability to distinguish between these types is required in some CPU processes.

"Variables" or "names" in programming languages are permitted to be alphameric. Names such as PAYFILE, MANNUMBER, CHKPT, SAM, A123, JUMP2, JUMP3, are acceptable. Such names are called "symbolic", and they will be translated by the assembly or compile process into absolute, numeric memory addresses. The programmer may also use "absolute" addresses, which will be pure numerics, such as 17326, 4653, etc. The assembly or compile process must, in an early phase, be able to distinguish between absolute and symbolic addresses. Absolute addresses are always pure numerics; symbolic addresses may be pure alphabetics or mixed alphamerics. The rule is that absolute addresses must be pure numerics and symbolic addresses must have the first character an alphabetic. The rule for distinguishing, then, applies to the first character; if it is alphabetic, the address is symbolic, if it is numeric, the address is absolute. The ability to distinguish all numerics, as a character type, from all alphabetics, as a character type, leads to greater efficiency in assembling and compiling.

An application that will assume increasing importance in the future is that of message processing. The kind of message involved is human-oriented text -- a telegram is a good example. As communication networks play an ever-increasing role in the military and business world, the ability to send messages from one place to many places, from many places to one central place, to re-route messages, to analyze messages and to determine from the analysis of the message itself the source(s) and destination(s) of the messages will become more essential. Many (most) of these messages will originate at typewriter-oriented terminals, and will end at similar terminals, with a CPU in the message-switching center to process messages.

Two kinds of controls are evident in typewriter-oriented terminals; first, format effectors such as tab, carriage return, line feed, backspace, case shift, etc; second, terminal or transmission controls such as, punch on, punch off, reader one, reader off, end of block, end of transmission, escape, bypass, restore, etc.

In codes currently being developed and proposed for the terminal and transmission area, controls will be embodied in the code itself. Certain character codes will be reserved to stand for control codes of the kind just previously described. It will be an advantage to the CPU processes if control characters can be easily distinguished from the data-characters of Specials, Alphabetics, Digits.

How may character-types be distinguished or "separated" by the CPU? The combined hardware/software task will be easier (more efficient) if the character types are grouped in the ECS so that hardware separation is simple. Two methods of character separation are of interest.

For character machines that find it difficult (or impossible) to analyze to the bit level, but can analyze to the character level, the "bracket test" may be used. For example, suppose a 6-bit, 64 character set is proposed. The 64 possible binary characters have decimal equivalents from 0 to 63. Suppose the structure of the set is such that the decimal equivalents of the binary 6-bit characters are as shown:

| Character Type | Decimal Equivalent | Bracket Test | | |
|---|---|---|---|---|
| Controls | 0-9 | 0 | Character | 9 |
| Specials | 10-19 | 10 | Character | 19 |
| Digits | 20-29 | 20 | Character | 29 |
| Alphabetics | 30-55 | 30 | Character | 55 |
| Unassigned | 56-63 | | | |

Then the character-types can be bracketed by character comparison tests as shown, using the Comparison instruction. In general, at least two instructions are necessary to determine the character type by bracketing.

For binary machines which can analyze to the bit level, a "high order bit test" may be used. For example, suppose a 7-bit, 128 character set is proposed. Suppose the set is partitioned into four groups on the basis of the two high order bits as shown:

| Character Type | Bit Pattern |
|---|---|
| Controls | 00XXXXX |
| Specials | 01XXXXX |
| Alphabetics | 10XXXXX |
| Digits | 11XXXXX |

Then the character types can be separated by examining the two, high-order bits. In general, a single instruction can determine the character type by bit testing of a well-structured code set.

To summarize, assuming the need to edit data, separability is clearly a desirable property of an 8-bit ECS.

## COMPATIBILITY

In the computing world, different kinds of compatibility are held to be important. In a family of computers, an upward compatibility of machine language instructions is generally required. For example, an IBM 7090 machine language program will run without modification on an IBM 7094 (also 1620I/1620II, etc.). Sometimes, compatibility at the symbolic or assembly language level is sufficient. Compatibility at the compiler language level permits programs from one family of computers to be run on other families of computers, or from one manufacturer's computer on another manufacturer's computer; again, an upwards compatibility is sufficient, a compiler language program (Cobol or Fortran) written for a small scale CPU will run on a large scale CPU.

A different kind of compatibility is embodied in character sets. This kind of compatibility permits data to be interchanged between, and processed on, many different computers. The character set that can be processed by the great preponderance of computing installations today (and presumably in the future) is defined in the Standard BCD Interchange Code.

The Standard BCD Interchange Code is a 6-bit, 64 character set. It defines graphics (or characters), bit codes, and card codes. In this paper, an 8-bit code will be discussed. Clearly, an 8-bit code cannot be identically equal to a 6-bit code and vice versa. What form of compatibility can exist between a 6-bit code and an 8-bit code? Suppose that all of the graphic characters (Specials, Alphabetics, Digits) of the 6-bit set are included in the 8-bit set. Then one form of compatibility is to assign the graphics in the 8-bit ECS so that their low order 6 bits are the same as the 6-bit characters assigned to the graphics in the 6-bit set. Then data can be interchanged and processed between 6-bit and 8-bit CPU's if some simple "rules of compatibility" are observed.

8-bit to 6-bit

(A) Send only the code elements of the 6-bit set.

(B) For those code elements, strip off the two high order bits.

6-bit to 8-bit

(A) Send all code elements of the 6-bit set.

(B) When the 6-bit code enters the 8-bit environment, let the 6 bits of the 6-bit character become the low order 6 bits of the 8-bit character.

(C) Assign the appropriate high order 2 bits according to some (hopefully) simple rule which can be embodied in hardware.

This idea is amplified more specifically later in this paper.

This "compatibility by rules" approach allows a 6-bit CPU and an 8-bit CPU to interchange information if they both agree to restrict their information to the graphics of the 6-bit CPU. Is such compatibility worthwhile? The remainder of this section discusses the unpleasant implications of not providing compatibility of data characters.

## Keypunching of Data

The preponderant amount of keypunched data today assumes the card code prescribed in the Standard BCD Interchange Code. In keypunches, the depression of a specific key punches a specific card code. How might a different card code be punched? The first possibility is that the keypunch encoder might be changed. It is safe to say that splitting the keypunch market by encoder would cause increased costs of both types.

In addition, the incorporation of 64 card-codes will increase the cost of new keypunches, particularly printing keypunches. The user who is presented with the suggestion that he take a new keypunch that provides little additional function (or speed) over his present keypunch, but comes at a higher price would predictably reject such a suggestion with great vigor. The market for such a keypunch being, therefore, negligible, it is unlikely to be accepted. The second possibility is to leave the translator unchanged, and change the key caps. For example, if it was desired to associate the graphic "S" with the card code 12-3, since the key "L" currently generates the card code 12-3, then change key caps so that the "S" key cap sits on the key previously labelled "L". This suggestion is patently unworkable, since it disrupts the keyboard in a way that would require extensive retraining of keypunch operators. The user's reaction to such a keypunch would predictably be negative. Suppose, then, that the keypunch is left unchanged, which says that the assignment of graphics to card codes is that prescribed by the Standard BCD Interchange Code.

## Existing Card Files

Another strong reason for maintaining card code compatibility arises from considering the problem of a user's existing card files which are in the BCD Interchange Card Code. Suppose, again, a different card code were defined. The user could process all his existing card files through the CPU and convert them to the new card code. This would be a one-time conversion cost, but it would be substantial, especially for those users with large card files. As an alternative, the manufacturer could provide a double-translator which would translate both the BCD Interchange Card Code and the new card code. The user could then avoid the cost of conversion. However, the double-translator would cost more than the old, single translator, so that this approach imposes on the user not a one-time conversion cost, but an additional, monthly cost which would continue as long as he wished to process his old BCD Interchange Card Code files at which time he would still be faced with a substantial portion of the one-time conversion cost. The conclusion is the same as in the previous section. Faced with approaches that would cost him more without additional function or speed, the user would predictably reject the proposition.

## Bit Code

Assuming then, that the card code should remain unchanged, what can be said about the bit code? It is necessary to consider some of the elements involved in card-to-bit translation. The card rows are Divided into zone-rows and numeric-rows. With a few exceptions, the hardware translation defined in the BCD Interchange Code defines a card-zone to bit-zone translation, and card-numeric to BCD-bit translation. The zone translation can be modified somewhat in hardware without changing the cost, but a change in the numeric-to-BCD translation can increase the cost of the hardware appreciable. These translators are involved in many of the fundamental processes of data preparation: card-to-tape, card-to-small CPU-to-tape, for example. Such additional costs, of course, would be borne by the user. There is, then, a strong reason for maintaining bit-code compatibility with the BCD Interchange Code, to avoid increased costs.

## Information Interchange

Suppose a new CPU were introduced into the market that was not code-compatible with a current BCD Interchange computers. Many users would not change to the new CPU's immediately (and many would not change at all). The established media for information interchange in the data processing world are cards and magnetic tape. With incompatible card and magnetic tape codes, the two types of installations would experience great difficulty in interchanging programs and data. These difficulties could be removed by providing double translators, or by providing software translation packages. The additional costs for software or hardware, would be borne by the user. Programs and data are being successfully interchanged today. What would be the reaction of a user who was provided with no more than the same ability, but at a cost additional to that with which he is accomplishing the job today? Predictably, negative.

To summarize, assuming the upwards code compatibility described in the previous sections, card and bit code compatibility is clearly a desirable property of an 8-bit ECS.

# SUBSETABILITY

An 8-bit CPU will be operating in an evironment that is not entirely 8 bits. As described in previous sections, it may expect to send information to, and receive information from, a 6-bit environment. A 6-bit subset should be obtainable from the 8-bit ECS with a minimum (or no) translation.

An important transmission facility has been offered which readily permits the transmission of 8 bits at 150 bits per second. If one of these 8 bits is used for a parity bit (not necessarily a foregone conclusion), the transmission character size will effectively be 7 bits. A 7-bit transmission subset should be obtainable from the 8-bit ECS. A 6-bit transmission subset should also be obtainable from the 8-bit ECS.

A 7-bit (128 characters) printing subset should be obtainable from the 8-bit subset. This 7-bit printing subset will almost certainly not be the same as the 7-bit transmission subset.

The 64 graphics of the BCD Interchange Code should also be obtainable as a 6-bit set. For compatibility, it is preferable that the bit codes associated with the graphics of the 6-bit set be those of the BCD Interchange Code.

An illustrative, 8-bit ECS for information interchange, with simply related subsets, are presented by the attached charts. The eight-bit code may be visualized as a single standard code for information interchange, but its related subsets are also significant standard codes for information interchange.

A Compatible 8-Bit ECS Code for Information Interchange is presented on Chart 4 as a candidate for consideration. Also presented are simply related subsets, as above. Chart 5 shows existing codes which will remain useful with either ECS Code.

# CHART 1

## AN 8-BIT ECS CODE FOR INFORMATION INTERCHANGE

| 87 | 00 | | | | 01 | | | | 10 | | | | 11 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 65<br>4321 | 00 | 01 | 10 | 11 | 00 | 01 | 10 | 11 | 00 | 01 | 10 | 11 | 00 | 01 | 10 | 11 |
| 0000 | | | | | | | | | | | | ↑ | ① | ② | | 0 |
| 0001 | | | LEM | SOM | | | | | a | j | ③ | ↓ | A | J | ③ | 1 |
| 0010 | | | | EOA | SP | ! | / | ? | b | k | s | → | B | K | S | 2 |
| 0011 | | | | EOM | . | $ | , | = | c | l | t | ← | C | L | T | 3 |
| 0100 | | | | WRU | ) | * | ( | ' | d | m | u | { | D | M | U | 4 |
| 0101 | | | | RU | [ | ] | WS | : | e | n | v | } | E | N | V | 5 |
| 0110 | | | | Bell | < | ; | \ | > | f | o | w | ∧ | F | O | W | 6 |
| 0111 | | | | SK | GM | MC | SM | TM | g | p | x | ∨ | G | P | X | 7 |
| 1000 | | | | VT | + | - | RM | | h | g | y | ∀ | H | Q | Y | 8 |
| 1001 | | | | FF | | | | | i | r | z | ¬ | I | R | Z | 9 |
| 1010 | | SIL | EB | ERR | | | | | \| | \| | \| | ≡ | | | | |
| 1011 | | | | ACK | | | | | | | | ≠ | | | | |
| 1100 | RE | PF | PN | BY | | | | | User | | | | | | | |
| 1101 | HT | CR | LF | RS | | | | | Choice | | | | | | | |
| 1110 | LC | BS | IL | UC | | | | | Graphics | | | | | | | |
| 1111 | ET | | E 1 | | | | | | | | | | | | | DL |

Note ① Reserved for Plus Zero.

Note ② Reserved for Minus Zero.

Note ③ Reserved for Escape Code in Smaller Sets.

# CHART 2

## SUBSETS OF 8-BIT ECS CODE

| | A 7-Bit Printing Set | | | | | | | | A 6-Bit Information Interchange Set | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 87 | 0 | | | | 1 | | | | | | | |
| 65<br>4321 | 00 | 01 | 10 | 11 | 00 | 01 | 10 | 11 | 00 | 01 | 10 | 11 |
| 0000 | | | | ↑ | + | - | ǂ | 0 | + | - | RM | 0 |
| 0001 | a | j | | ↓ | A | J | | 1 | A | J | E2 | 1 |
| 0010 | b | k | s | → | B | K | S | 2 | B | K | S | 2 |
| 0011 | c | l | t | ← | C | L | T | 3 | C | L | T | 3 |
| 0100 | d | m | u | { | D | M | U | 4 | D | M | U | 4 |
| 0101 | e | n | v | } | E | N | V | 5 | E | N | V | 5 |
| 0110 | f | o | w | ∧ | F | O | W | 6 | F | O | W | 6 |
| 0111 | g | p | x | ∨ | G | P | X | 7 | G | P | X | 7 |
| 1000 | h | q | y | ∀ | H | Q | Y | 8 | H | Q | Y | 8 |
| 1001 | i | r | z | ¬ | I | R | Z | 9 | I | R | Z | 9 |
| 1010 | \| | \| | \| | ≡ | SP | ! | / | ? | SP | ! | / | ? |
| 1011 | | | | ≢ | . | $ | , | = | . | $ | , | = |
| 1100 | | User | | | ) | * | ( | ′ | ) | * | ( | ′ |
| 1101 | | Choice | | | [ | ] | ∨ | : | [ | ] | WS | : |
| 1110 | | Graphics | | | < | ; | \ | > | < | ; | \ | > |
| 1111 | \| | \| | \| | \| | ⧧ | Δ | ⧻ | √ | GM | MC | SM | TM |

# CHART 3

## DATA TRANSMISSION SUBSETS OF AN 8-BIT ECS CODE

| | A 7-Bit Set | | | | | | | | A 6-Bit Set | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 87 | 0 | | | | 1 | | | | | | | |
| 65<br>4321 | 00 | 01 | 10 | 11 | 00 | 01 | 10 | 11 | 00 | 01 | 10 | 11 |
| 0000 | + | - | RM | 0 | ② | ② | EB | ② | + | - | RM | 0 |
| 0001 | A | J | E2 | 1 | a | j | LEM | SOM | A | J | EZ | 1 |
| 0010 | B | K | S | 2 | b | k | s | EOA | B | K | S | 2 |
| 0011 | C | L | T | 3 | c | l | t | EOM | C | L | T | 3 |
| 0100 | D | M | U | 4 | d | m | u | WRU | D | M | U | 4 |
| 0101 | E | N | V | 5 | e | n | v | RU | E | N | V | 5 |
| 0110 | F | O | W | 6 | f | o | w | Bell | F | O | W | 6 |
| 0111 | G | P | X | 7 | g | p | x | SK | G | P | X | 7 |
| 1000 | H | Q | Y | 8 | h | q | y | VT | H | Q | Y | 8 |
| 1001 | I | R | Z | 9 | i | r | z | FF | I | R | Z | 9 |
| 1010 | SP | ! | / | ? | ② | ② | ② | ERR | SP | ! | / | ? |
| 1011 | . | $ | , | = | ② | ② | ② | ACK | . | $ | , | = |
| 1100 | RE | PF | PN | BY | ) | * | ( | ' | RE | PF | PN | BY |
| 1101 | HT | CR | LF | RS | [ | ] | WS | : | HT | CR | LF | RS |
| 1110 | LC | BS | IL | UC | < | ; | \ | > | LC | BS | IL | UC |
| 1111 | ET | ② | E1 | ① | GM | MC | SM | DL | ET | | E1 | DL |

Note ① Reserved for Delete in 6-bit Punched Tape.

Note ② Unassigned.

# CHART 4

## A COMPATIBLE 8-BIT ECS CODE FOR INFORMATION INTERCHANGE

| 87<br>65<br>4321 | 00 | | | | 01 | | | | 10 | | | | 11 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 00 | 01 | 10 | 11 | 00 | 01 | 10 | 11 | 00 | 01 | 10 | 11 | 00 | 01 | 10 | 11 |
| 0000 | | | | | SP | | | | | | | ↑ | ? | ! | RM | 0 |
| 0001 | | | LEM | SOM | | | / | | a | j | | ↓ | A | J | | 1 |
| 0010 | | | | EOA | | | | | b | k | s | → | B | K | S | 2 |
| 0011 | | | | EOM | . | $ | , | = | c | l | t | ← | C | L | T | 3 |
| 0100 | | | | WRU | ) | * | ( | ' | d | m | u | { | D | M | U | 4 |
| 0101 | | | | RU | [ | ] | WS | : | e | n | v | } | E | N | V | 5 |
| 0110 | | | | Bell | < | ; | \① | > | f | o | w | ∧ | F | O | W | 6 |
| 0111 | | | | SK | GM | MC | SM | TM | g | p | x | ∨ | G | P | X | 7 |
| 1000 | | | | VT | + | - | SB | | h | q | y | ∀ | H | Q | Y | 8 |
| 1001 | | | | FF | | | | | i | r | z | ¬ | I | R | Z | 9 |
| 1010 | | SY<br>IL | EB | ERR | | | | | \| | \| | \| | ≡ | | | | |
| 1011 | | | | ACK | | | | | | | | ≠ | | | | |
| 1100 | RE | PF | PN | BY | | | | | | User | | | | | | |
| 1101 | HT | CR | LF | RS | | | | | | Choice | | | | | | |
| 1110 | LC | BS | IL | UC | | | | | | Graphics | | | | | | |
| 1111 | ET | | E1 | | | | | | | | | | | | | |

Note ① Dual for Escape in Smaller Sets.

# CHART 5

## EXISTING DATA PROCESSING SUBSETS OF THE 8-BIT ECS CODE

### BCD Interchange Code

| 87<br>65<br>4321 | 00 | 01 | 10 | 11 |
|---|---|---|---|---|
| 0000 | SP | SB | - | + |
| 0001 | 1 | / | J | A |
| 0010 | 2 | S | K | B |
| 0011 | 3 | T | L | C |
| 0100 | 4 | U | M | D |
| 0101 | 5 | V | N | E |
| 0110 | 6 | W | O | F |
| 0111 | 7 | X | P | G |
| 1000 | 8 | Y | Q | H |
| 1001 | 9 | Z | R | I |
| 1010 | 0 | RM | ! | ? |
| 1011 | = | , | $ | . |
| 1100 | ' | ( | * | ) |
| 1101 | : | WS | ] | [ |
| 1110 | > | \ ① | ; | < |
| 1111 | TM | SM | MC | GM |

### 64 Position 12-Bit Punched Card Code

| zone<br>digit | 12 | 11 | 0 | blank |
|---|---|---|---|---|
| blank | + | - | 2-8<br>SB | SP |
| 1 | A | J | / | 1 |
| 2 | B | K | S | 2 |
| 3 | C | L | T | 3 |
| 4 | D | M | U | 4 |
| 5 | E | N | V | 5 |
| 6 | F | O | W | 6 |
| 7 | G | P | X | 7 |
| 8 | H | Q | Y | 8 |
| 9 | I | R | Z | 9 |
| 0 | ? | ! | 0-2-8<br>RM | 0 |
| 3-8 | . | $ | , | = |
| 4-8 | ) | * | ( | ' |
| 5-8 | [ | ] | WS | : |
| 6-8 | < | ; | \ ① | > |
| 7-8 | GM | MC | SM | TM |

Note ① Escape Control Code for Larger Sets.

# CHART 6

## COMPATIBLE DATA TRANSMISSION SUBSETS OF AN 8-BIT ECS CODE

| 87<br>65<br>4321 | A 7-Bit Set | | | | | | | | A 6-Bit Set | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | | | | 1 | | | | | | | |
| | 00 | 01 | 10 | 11 | 00 | 01 | 10 | 11 | 00 | 01 | 10 | 11 |
| 0000 | SP | SB | - | + | ② | ② | ② | ② | SP | SB | - | + |
| 0001 | 1 | / | J | A | SOM | LEM | j | a | 1 | / | J | A |
| 0010 | 2 | S | K | B | EOA | s | k | b | 2 | S | K | B |
| 0011 | 3 | T | L | C | EOM | t | l | c | 3 | T | L | C |
| 0100 | 4 | U | M | D | WRU | u | m | d | 4 | U | M | D |
| 0101 | 5 | V | N | E | RU | v | n | e | 5 | V | N | E |
| 0110 | 6 | W | O | F | Bell | w | o | f | 6 | W | O | F |
| 0111 | 7 | X | P | G | SK | x | p | g | 7 | X | P | G |
| 1000 | 8 | Y | Q | H | VT | y | q | h | 8 | Y | Q | H |
| 1001 | 9 | Z | R | I | FF | z | r | i | 9 | Z | R | I |
| 1010 | 0 | RM | ! | ? | ERR | EB | SIL | ② | 0 | RM | ! | ? |
| 1011 | = | , | $ | . | ② | ② | ② | ② | = | , | $ | . |
| 1100 | BY | PN | PF | RE | ' | ( | * | ) | BY | PN | PF | RE |
| 1101 | RS | LF | CR | HT | : | WS | ] | [ | RS | LF | CR | HT |
| 1110 | UC | IL | BS | LC | > | E2 | ; | < | UC | IL | BS | LC |
| 1111 | ET | E1 | ② | ① | TM | SM | MC | DL | ET | E1 | ② | DL |

Note ① Reserved for Delete in 6-bit Punched Tape.

Note ② Unassigned.

Data Processing Group

bema

Business Equipment Manufacturers Association
235 East 42nd Street, New York 17, New York — MUrray Hill 7-5969

## ASA SUBCOMMITTEE X3.2 - CHARACTER SETS AND DATA FORMAT

### MINUTES

Meeting #22 of August 22 - 23, 1962
BEMA, New York City

### SUMMARY

Preparation for October ISO meetings, consideration of a paper by Mr. C. E. MacKenzie entitled "The Construction of 8-bit Coded Character Sets" referred by BEMA/DPG engineering committee, and a discussion of economic factors were among the major topics dealt with at this meeting.

Next meeting to be held in New York on September 11 - 12.

R. E. UTMAN
JAN 7 1963
BEMA/DPG

NMAH
310/3

## MINUTES OF X3.2 MEETING OF AUGUST 22 - 23, 1962

(Item numbers correspond to agenda except for "X" numbers.)

X.1 AGENDA, approved as amended, is shown as Appendix I.

1. Membership and attendance are shown in Appendix II.

X.2 Mr. C. A. Phillips spoke to X3.2 on the following:

1. His decision to postpone the August 21st, X3 meeting till September 10th because of the current apparent lack of consensus on the proposed code standard.
2. Activities of the Governmental Affairs subcommittee of the House Appropriations Committee and their intention to set up an industry government committee for standardization of Input-Output equipment. Mr. Phillips and Dr. Barker went to Washington to make known the existance of ASA-BEMA-X3 activities to those concerned who were not aware of it.

2. Minutes of previous meeting were approved as amended.

3. Administrative Business

3.1. Membership

- a. Mr. M. Franklin (IBM) was accepted as alternate member.
- b. Mr. C. MacKenzie (IBM) was accepted as consultant.
- c. Mr. T. H. Bonn resigned (orally) indicating his company's desire for Mr. Clamons to be member from Univac. Mr. Clamons was accepted as member, subject to written verification. (A verifying telegram arrived during the meeting).
- d. Mr. D. Kerr attended as observer from AT&T. A letter is being prepared nominating him as alternate.
- e. A motion was passed (Mr. Booth moved, Mr. Spielman seconded) as follows:

"The Chairman is requested to correspond with C. Macon,

L. Bloom and T. Bonn expressing appreciation of their participation in the past and requesting that they accept the status of consultants and give comments and attend meetings, when mutually convenient."

4. Reports on Working Groups and Other Committee Activities.

a. Mr. Booth submitted two items re. liaison with AIEE Computing Devices Committee, Computer Standards Subcommittee listed in Appendix III as items 1 and 2.

b. Mr. Blue reported on Joint Punch Card group liaison. Mr. Mullendore is to lead work of implementation of new card code in current (physical) card. Mr. Blue is to lead work in extension of current code used in 80 column cards. (These correspond to items 2 and 1 respectively on p.3 of X3.2 minutes of July 25 - 27 meeting.)

Item 5 of agenda was deferred to next day when X3.2 international representative was to be present).

6. New Business Resulting from BEMA/DPG and X3 Meetings.

a. Paper referred by BEMA/DPG on IBM derivative code was taken up for consideration.

b. The paper was read by those present.

c. Mr. MacKenzie, author of the paper, discussed the code approach described in his paper.

A motion was made by Mr. Booth, seconded by Mr. Quantz, as follows:

The material presented by Mr. MacKenzie, in conjunction with his paper entitled "The Construction of 8-bit Coded-Character Sets" referred to X3.2 by BEMA/DPG engineering committee has been reviewed and, since it is based on a structure which was rejected earlier by X3.2, the X3.2 subcommittee does not recommend revision or withdrawal of ASCII of May 25, 1962.
Vote: Yes (7), No (1), Abstain (1).

A motion to terminate discussion on the code paper referred by BEMA/DPG at this time was passed.

7. Economic Analysis

An opening statement was made by Mr. Blue who had requested inclusion of this item on the agenda.

Mr. Booth provided information on the history of economic studies by committees in ASA standards activities, obtained from Mr. V. Grey, to the effect that none have been made in the past.

Mr. Bonn asked if the code set shown on Chart 5 of Mr. MacKenzie's paper, could be economically implemented in cheapest electric mechanical equipment. Mr. Booth said this code, which is essentically the IBM Card code, had been examined, and was not economical to implement on such equipment. (The problem of retaining a 1-bit difference for upper and lower shift pairs of characters on the same key is involved here, as evidenced by previous discussions.)

The basic ground rules and framework of meaningful economic studies were discussed. It did not appear feasible for X3.2 to undertake detailed studies of the economics of conversion to a new code because such studies should be made in user context, and should incorporate estimates of cost of new equipment derived from manufacturers. This latter information is not apt to be made available by manufacturers outside their own organization.

The following was moved by Mr. Blue and seconded by Mr. Muise:

"Whereas the acceptance of the proposed ASCII implies a conversion from equipments and practices in current use for data processing and communications, and whereas standards in the U.S. are voluntary and whereas acceptance of the proposed ASCII will depend upon cost to the users: Resolve that the X3.2 subcommittee request the sponsor BEMA/DPG to have its members furnish assumptions which can be applied by users to estimate cost of conversion."

Voting on the above motion was: No (6), Yes (1), and Abstain (1). This was followed by a two minute period by each member for any further discussion.

The meeting reconvened on the morning of August 23rd.

5. Preparation for October ISO Meetings.

5.1 Policy on character assignments in unassigned section of proposed ASCII: The points raised in ECMA letter of June 27 to M. Birle were discussed.

Messrs. Auwaerter and Clamons agreed to draft a revised note 1 for proposal B of 3 - 4 May (WG B), and submit same to X3.2.

Members are to review points raised and be prepared to discuss them at the September meeting.

The following motions were passed unanimously:

Moved by Mr. Auwaerter, Seconded by Mr. Clamons.
I move the following resolution:

> The X3.2 Subcommittee supports, in principle, the reservation of that portion of the Proposed ASCII, dated May 25, 1962, and of Proposal B, dated 3 et 4 Mai, 1962, of ISO/TC 97/GT B marked as "UNASSIGNED" (exclusive of the four highest order character positions of the sets) for graphic rather than control information."

Moved by Mr. Auwaerter, Seconded by Mr. Quantz.

> "I move that the Subcommittee set up a Task Group to further consider the question of assignment of graphics to that portion of the proposed ASCII, dated May 25, 1962, and of Proposal B, dated 3 et 4 Mai, 1962, of ISO/TC 97/GT B marked as "UNASSIGNED" (exclusive of the four highest order character positions of the sets) and, if upon analysis such reservation appears appropriate, to make recommendations as to which one or more sets of graphics, in any, should be standardized in that "UNASSIGNED" area."

The chairman was authorized to appoint a task group at his discretion.

5.2 U.S. interpretation of the function of the related 6-bit subset in Proposal B, ISO/TC 97/WG B resolution.

The following resolution was proposed by Mr. Hassan, seconded by Mr. Chesterman:

> "The U.S. position in the ISO TC 97 October 1962 meetings with respect to Proposal B of WG B (3 - 4 May, 1962) should be in full support of the 7-bit set for general, domestic and international, information interchange, subject to such qualifications as may be required due to minor differences between it and the proposed ASCII of May 25, 1962. Support of the related 6-bit set should be subject to its being designated for use on a more limited basis."

The vote was: Yes (9), No (0), Abstain (1).

Note was taken of the necessity for the X3.2 international delegate to be instructed by X3 and the possiblity that X3 would request X3.2 to provide technical guidance on the U.S. position. Resolution above adopted by X3.2 is to be communicated to X3 by chairman of X3.2.

11. New Business

a. The discussions with AIEE Computer Standards committee special task group were considered. Their desires for some rewording of the proposed ASCII were discussed. The chairman was authorized to indicate that the changes offered were acceptable subject to some "rewording".

b. Mr. L. Boardman of the American Society of Consulting Engineers submitted some comments indicating interest in a 6-bit interchange set. The Chairman indicated his intention to confer with Mr. Boardman.

c. A speaker has been requested to be furnished by X3.2 for the Toronto SHARE meeting to speak on the proposed standard code. Mr. Quantz was appointed by the Chairman to represent X3.2 on September 11th, at this meeting.

Meeting adjourned.

A H Hassan
A. H. Hassan
Secretary, X3.2

APPENDIX I

## ASA X3.2 - Character Sets and Data Formats

PROPOSED AGENDA - Meeting of August 22 - 24, 1962, BEMA, 235 East 42nd St., New York City. First session 9:30 AM

1. Attendance
2. Minutes of previous meeting
3. Administrative Business
   3.1 Membership matters
4. Reports on working groups and other committee activities
5. Preparation for October ISO meetings
   5.1 Policy on character assignments in the unassigned section of the proposed ASCII
   5.2 U.S. interpretation of the function of the related 6-bit subset in Proposal B - ISO/TC 97 WGB resolution
   5.3 New items of business
6. New business resulting from BEMA/DPG or X3 meetings: "8-bit coded sets"
7. Economic Analysis
8. Proposed magnetic tape standard
9. Joint Task Groups - adminstration and instruction of
10. Discussion of "ESCAPE"
11. New Business
    A. Definition of terms
    B. A.I.E.E.
    C. A.C.M.E.
    D. Toronto Share meeting
12. Date of Next Meeting: September 11 - 12, New York City

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APPENDIX II

## X3.2 Meeting

August 22 - 23, 1962

### Membership Status and Attendance

| Member | Application | August 22 - 23 | | Alternate | August 22 - 2 | |
|---|---|---|---|---|---|---|
| J. Auwaerter | Teletype Corp. | | x | J. Booth | x | X |
| R. E. Blue | IBM Corp. | x | x | M. Franklin | x | |
| E. H. Clamons | Univac | x | x | | | |
| J. F. Chesterman | Bell Tel-Labs. | x | x | | | |
| L. L. Griffin | Navy Dept. | x | x | | | |
| R. M. Gryb | AT&T Co | | | | | |
| A. H. Hassan | NCR | x | x | S. Porter | | |
| H. Layton | Monroe Calc. Mach.Co. | x | x | | | |
| H. Kleinberg | RCA | | | H. Spielman | x | |
| R. Muise | Minn-Honeywell | x | x | T. Bousquet | | |
| P. Quantz | Burroughs | x | x | G. Shimabukuro | | |
| H. Tholstrup | Friden, Inc. | | x | | | |
| A. Ungar | I.T.T. | | | J. Trawick | x | X |

CONSULTANTS

| | | | |
|---|---|---|---|
| H. J. Smith | IBM | | |
| C. E. MacKenzie | IBM | x | |
| W. J. Luebbert | U.S. Military Academy | | |

OBSERVERS

| | | | |
|---|---|---|---|
| J. Bartelt | IBM | x | |
| T. Bonn | Univac | x | |
| D. Kerr | AT&T Co. | x | x |

# ASA X3.2 Membership List

4 Sept 1962

| Member | Alternate |
|---|---|
| John F. Auwaerter<br>Director of Product Development<br>Teletype Corporation<br>5555 Touhy Avenue<br>Skokie, Illinois<br>Tel: 312 OR-6-1000 | John B. Booth<br>Teletype Corporation<br>233 Broadway<br>Room 624<br>New York, New York<br>Tel: 212 WO-2-1876 |
| Robert E. Blue<br>IBM Corporation<br>~~112 East Post Road~~ 1000 Westchester Ave<br>~~White Plains~~ Harrison, New York<br>Tel: 914 WH-9-1900 (Ext 5962)<br>Ro-1-1900 Ext 2489) | M. J. Franklin<br>IBM Corporation<br>Data Systems Division<br>South Road Laboratory<br>Poughkeepsie, New York<br>Tel: 914 GL-4-1000 (Ext 5886 M) |
| E. H. Clamons<br>UNIVAC Division<br>Sperry Rand Corporation<br>P.O. Box 500<br>Blue Bell, Pennsylvania<br>Tel: 215 MI-6-9000 (Ext 404) | None |
| J. F. Chesterman<br>Bell Telephone Labs (2F 517)<br>Holmdel, New Jersey<br>Tel: 201 949-3968 | None |
| L. L. Griffin<br>Navy Management Office<br>Navy Department<br>Washington 25, D.C.<br>Tel: 202 OX-6-7277 | None |
| R. M. Gryb<br>American Tel. & Tel. Co.<br>195 Broadway<br>New York, New York<br>Tel: 212 393-3671 | D. A. Kerr (Proposed)<br>American Tel. & Tel. Co.<br>195 Broadway - Room 1110<br>New York, New York<br>Tel: 212 393-3061 |
| Abe Hassan<br>National Cash Register Co.<br>Electronics Division<br>1401 E. El Segundo Blvd.<br>Hawthorne, California<br>Tel: 213 PL-7-1811 | Sig Porter<br>National Cash Register Co.<br>Electronics Division<br>1401 E. El Segundo Blvd.<br>Hawthorne, California<br>Tel: 213 PL-7-1811 |

316/3

RMAH

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| Member | Alternate |
|---|---|
| Harry Layton<br>Monroe Calculating Machine Co.<br>555 Mitchell Street<br>Orange, New Jersey<br>Tel: 201 OR-3-6600 | M. Mendelsohn<br>Monroe Calculating Machine Co.<br>555 Mitchell Street<br>Orange, New Jersey<br>Tel: 201 OR-3-6600 |
| Richard M. Muise<br>Minneapolis-Honeywell EDP<br>151 Needham Street<br>Newton Highlands 61, Mass.<br>Tel: 617 DE-2-6960 (Ext 236) | T. R. Bousquet<br>Minneapolis-Honeywell EDP<br>151 Needham Street<br>Newton Highlands 61, Mass.<br>Tel: 617 DE-2-6960 (Ext 374) |
| Paul Quantz<br>Burroughs Corporation<br>460 Sierra Madre Villa<br>Pasadena, California<br>Tel: 213 SY-3-6121 | George Shimabukuro<br>Burroughs Corporation<br>460 Sierra Madre Villa<br>Pasadena, California<br>Tel: 213 SY-3-6121 |
| H. Tholstrup<br>Commercial Controls Corporation<br>Friden, Inc.<br>One Leighton Avenue<br>Rochester 2, New York<br>Tel: 716 BU-8-1600 | None |
| Alan Ungar<br>International Tel. & Tel. Co.<br>Box 285<br>Paramus, New Jersey<br>Tel: 201 CO-2-6800 (Ext 341) | James Trawick<br>International Tel. & Tel. Co.<br>Box 285<br>Paramus, New Jersey<br>Tel: 201 CO-2-6800 (Ext 341) |
| H. Kleinberg<br>Manager, Computing Devices Eng.<br>Radio Corporation of America<br>Electronic Data Processing Division<br>Camden 2, New Jersey<br>Tel: 609 WO-3-8000 | H. Spielman<br>Computing Devices Eng.<br>Radio Corporation of America<br>Electronic Data Processing Division<br>Bldg. 82-1<br>Pennsauken, New Jersey<br>Tel: 609 WO-3-8000 (Ext PC-2044) |

## Consultants

| | |
|---|---|
| H. J. Smith<br>IBM Corporation<br>Yorktown, New York | Leon Bloom<br>Litton Corporation<br>(address not complete) |

## Consultants (continued)

C. E. Mackenzie
IBM Corporation
Data Systems Division
South Road Laboratory
Poughkeepsie, New York
Tel: 914 GL-4-1000

Major W. F. Lubbert
Dept. of Elec. Eng.
United States Military Academy
West Point, New York

T. H. Boon
Univac Division
Sperry Rand Corporation
P. O. Box 500
Blue Bell, Pennsylvania
Tel: 215 MI-6-9000

C. E. Macon
Burroughs Corporation
460 Sierra Madre Villa
Pasadena, California
Tel: 213 SY-3-6121

ASA SUBCOMMITTEE X3.2 - CHARACTER SETS AND DATA FORMAT

MINUTES (DRAFT)

R. E. UTMAN
SEP 28 1962
BEMA/DPG

Meeting #23 of September 11 - 12, 1962
BEMA, New York City

SUMMARY

Drafting of reply to ISO TC/97 WG B with regard to Proposal B of May 2 - 4, 1962, consideration of "escape" philosophy, and consideration of another tentative standard by Magnetic Tape Joint Task Group were among the major topics dealt with at this meeting.

Next meeting to be held in New York, October 30, - November 1 - 2.

HAM 2
3/63

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MINUTES OF X3.2 MEETING OF SEPTEMBER 11 - 12, 1962

1. Agenda as proposed by Chairman is shown in Appendix I. It was followed, but not in the order shown. The expression of the subcommittee's opinion with respect to the response to ISO/TC 97, WG B regarding Proposal B, and for guidance of U.S. delegates to WG B meeting to be held October 8 - 9, was considered the most important item of business and was taken up first.

2. Attendance and membership are shown in Appendix II.

3. The Chairman distributed a memorandum which he directed to the Joint Task Groups on media. This is included as Appendix III.

4. For guidance in drafting reply to WG B due September 15, and discussions on October 8 - 9, 1962 the following comments were generally agreed to represent the opinion of most of X3.2 subcommittee.

With respect to the 7-bit set:

a. Line Feed and Carriage Return should be separate codes — not combined in a single New Line Code.

b. (Back Space is needed as a unique character — possibly $FE_0$ would be a good location — 000 1000.)

c. Data Link Escape to be presented with supporting comments at $DC_0$

d. (Error, 001 0101, to mean error in data, not in transmission.)

e. LEM (Logical End of Medium) to be illustrated as end of desired information on a serially read punch card, — indication to be given that investigation is under way regarding other areas of applicability such as in magnetic tape.

f. Note 2, (Proposal B) indicating optional change of 4 characters, should be eliminated.

g. *+ to be traded with :;

h. Note 1 (Proposal B) to be reversed; i.e. [ / ] to be standard, but available for substitutuion in those nations requiring 29 characters for the alphabet.

① to appear in the chart.

i. ACKNOWLEDGE should be included in the fourth highest position.

j. U.S. delegates to relate how trade of *+ with :; came about and indicate reluctance to change because of collating and typewriter like keyboard device implementation implications.

k. Unassigned area should remain unassigned in the standard; the group generally favors reservation for graphics, but more study is required before decision.

5. The Chairman appointed a committee (X3.2.4) to study the Unassigned Area and make recommendations consisting of Mr. Clamons, Chairman and Mr. Blue, Mr. Layton, Mr. Auwaerter and Mr. Trawick.

> "Purpose to study and make recommendations regarding the assignment of characters in the UNASSIGNED area of the proposed ASCII exclusive of the four highest order positions in the set."

Principals of this committee may assign subsitutes. Interested members and alternates are encouraged to volunteer their assistance.

6. The following was moved by Mr. Hassan, seconded by Mr. Blue. Vote was Yes (10), No (0), Abstain (1).

> "MOVE the following be adopted as a guide in drafting the U.S. response to Working Group B:
>
> The related 6-bit subset contained in Proposal B is understood to be primarily intended for standardization to aid in matching peripherals and main frames of various manufacturers, especially in Europe. The resulting set may be useful

---

> in certain areas in the U. S., but, in general, for information interchange via data transmission and via the various media, the 7-bit standard is that which we feel is essential and are prepared to endorse."

7. Membership Actions

Mr. D. Kerr was accepted unanimously as Alternate for Mr. Gryb. Since Mr. Mendelsohn, proposed alternate for Mr. Layton, had not previously attended an X3.2 meeting, his cannot be voted on until the next meeting.

8. The Chairman noted that the necessary changes indicated as acceptable in his letter to A.I.E.E. (Mr. Ferguson), were adopted by X3 on September 10. (X3.2/4 has been revised accordingly.)

9. The question of X3.2's relation to WG D discussions was raised by Mr. Blue. This question was not resolved.

10. The following group was assigned the task by the Chairman of drafting reply to WG B, re. Proposal B; Messrs. Griffin, Auwaerter, Blue, Hassan and Quantz.

Mr. Griffin would be absent on September 12, being in Toronto to address a SHARE meeting. Mr. Auwaerter was due to return from Montreal by noon September 12th. (He was present September 11th till noon.) Mr. Booth was assigned to act in his place.

11. Mr. Clamons was appointed substitute chairman for the following day and was to meet with the remainder of the X3.2 subcommittee and take up the remainder of the agenda. Mr. Chesterman agreed to act as substitute secretary.

***

## MEETING OF X3.2 SUBCOMMITTEE, SEPTEMBER 12, 1962, (2nd DAY)

E. H. Clamons, Substitute Chairman

First Item

Discussion of Dick Muise's Liaison Report #2 on Joint Task Group for Input/Output on Magnetic Tape (TR-27.6.3/X3.2), dated August 30, 1962.

An 8-track (7 information tracks plus 1 parity track) has been proposed.

Clamons raised the question of whether it is wise to set a standard which limits the industry to 7 information tracks -- perhaps 8 information tracks will be ultimately needed, or will the Escape device by used satisfactorily to expand beyond the 128-character capacity of the ASCII?

> An 8-information-character tape could achieve the economy of two 4-bit characters per tape line internally. Also, an 8-bit information character permits greater size of instruction code on a single-character per instruction basis.

Kerr questioned how the foregoing reasoning applies to computers of the ADX type, which must store and process and forward messages in the 7-information-bit ASCII code, i.e., it must handle the ASCII code internally (not as a subset.)

Clamons is really concerned with taking the 7-information-character code into a computer where numeric characters require only 4 bits (information) — for a waste of 3 bits per numeric character.

Returning to our main point of comment: Is the 8-track magnetic tape standard sufficient, or should a 9-track (total) be the magnetic tape standard? Also, does a 9-track standard require 3/4" width, or, like Univac, can 9 tracks be put on 1/2" tape?

Clamons' point: should X3.2 suggest and urge a 9 (total) track tape as the best compromise for efficiency and to provide for handling ASCII? Bousquet suggests that a magnetic tape physical standard now is premature because the 6-bit subset* of the ASCII has not yet been developed.
*and other subsets

(Kerr and Bousquet will prepare a resolution, for voting on by the full committee after 1:00 P.M. today) Such a resolution was prepared — for typing and duplication to present later today to the full X3.2 committee for a vote.

Second Item

Escape Philosophy

Clamons sees three Escape Methods.

1. Each Escape is associated with one following character; hence each Escape combination (total of 127).
2. Escape is a mode shift character (but this would beg for a second Escape character to return from the other mode.)
3. Escape plus any graphic will accomplish an escape to one of several other modes.

Bousquet questions where Shift Out and Shift In fall in this philosophy.

(Meeting of reduced-size X3.2 group after lunch)

Kerr presented a discussion of need for 3 escapes:

DLE for synchronous transmission
Escape 1 — for data processing
Escape 2 — for communicators

Clamons suggested homework assignments for next meeting:

Kerr — formal statement of his 3-hierarchy level of escapes (above).
One or more other members — definition of Escape devices.

a. Shift to different mode (which requires a means of returning to normal mode).

b. Escape plus one character, which merely serves as a longer set of control characters.

Moved that Resolution below be adopted:
Moved by D. Kerr, Seconded by J. Chesterman. Vote was Yes (9), No (0), Abstain (0).

> Resolution:
> The X3.2 Subcommittee recommends that the Task Group for Input/Output on Magnetic tape investigate the desirability and feasibility of adopting a tape standard involving more than eight recording tracks in order to admit to possible needs for:

1. A synchronizing track which may be required for use with the recording method to be standardized.
2. Recording of future character sets of larger than 7-bit size, a possibility which was recognized by the X3.2 during their structuring of the 7-bit code.
3. A single physical magnetic tape medium to be used for both interchange and machine internal codes; such internal codes may require greater than 7 information bits for efficient use within the machine.

It should be emphasized that X3.2 does not necessarily favor a tape of greater capacity than required for recording of the ASCII, but that X3.2 is aware of the above considerations.

Minutes of the August 22 - 23, 1962 meeting were reviewed by the full Subcommittee, were amended and were unanimously approved as amended.

Remainder of the partial-meeting was devoted to delineating the various forms and types of escapes.

* * *

Minutes Submitted by A. H. Hassan

A. H. Hassan
Secretary X3.2

APPENDIX II

## X3.2 ATTENDANCE

| Member | Organization | September | | Alternate | September | |
|---|---|---|---|---|---|---|
| | | 11 | 12 | | 11 | 12 |
| P. A. Quantz | Burroughs Corp. | X | X | G. Shimabukuro | | |
| J. F. Chesterman | Bell Tel. Labs. | X | X | | | |
| R. M. Gryb | A.T.&T. | X | | D. A. Kerr | X | X |
| J. F. Auwaerter | Teletype | X | X | J. B. Booth | X | X |
| | RCA | | | H. Spielman | X | X |
| | Honeywell | | | T. Bousquet | X | X |
| R. E. Blue | IBM | X | X | | | |
| L. L. Griffin | Navy Dept. | X | | | | |
| A. H. Hassan | NCR | X | X | | | |
| | Monroe | | | M. Mendelsohn | X | X |
| E. H. Clamons | Univac | X | X | | | |
| | ITT (IEC) | | | J. F. Trawick | X | X |
| H. Tholstrup | Friden | | | | | |
| | | | | Observer | | |
| - | Honeywell | | | M. Ellis | X | X |

APPENDIX III

DEPARTMENT OF THE NAVY
NAVY MANAGEMENT OFFICE
WASHINGTON 25, D. C.

DPSD:LLG:cf
6 September 1962

MEMORANDUM FOR MR. H. HAYMAN, Chairman, Magnetic Tape Joint Task Group
MR. C. D. WHITAKER, Chairman, Punched Card Joint Task Group
MR. F. A. WILLIAMS, Chairman, Punched Tape Joint Task Group

Subj: Media Representation of the Proposed American Standard Code for Information Interchange.

When the organizational structure and general detail of the Proposed American Standard Code for Information Interchange was identified by ASA Subcommittee X3.2, task groups were formed to consider representation of the code in magnetic tape, perforated tape, and punched card media. These groups were later included in the present Joint Task Groups. In the meantime, work on the proposed standard code has continued at both the national and international level.

We understand that the Joint Task Groups are addressing themselves to representation of the proposed standard code, as identified in Document X3.2/4 dated 25 May 1962. We would appreciate receiving from you, as soon as possible, information in the area of media representation that would contribute to further development or refinement of this proposed standard.

We would particularly like any information you can supply, which would contribute to the work of the October meetings of ISO/TC97 Working Groups B and D, scheduled to begin on 8 October 1962.

Regards,

L. L. GRIFFIN
Chairman, ASA X3.2 Subcommittee

Copy to:
Mr. Utman - Secretary X3
→ Mr. A. Hassan - Secretary X3.2

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APPENDIX V

## ASA X3.2 MEMBERSHIP LIST

12 September 1962

| Member | Alternate |
|---|---|
| John F. Auwaerter<br>Director of Product Development<br>Teletype Corporation<br>5555 Touhy Avenue<br>Skokie, Illinois<br>Tel: 312 OR-6-1000 | John B. Booth<br>Teletype Corporation<br>233 Broadway<br>Room 624<br>New York, New York<br>Tel: 212 WO-2-1876 |
| Robert E. Blue<br>IBM Corporation<br>1000 Westchester Avenue<br>Harrison, New York<br>Tel: 914 RO-1-1900 (Ext. 2489) | M. J. Franklin<br>IBM Corporation<br>Data Systems Division<br>South Road Laboratory<br>Poughkeepsie, New York<br>Tel: 914 GL-4-1000 (Ext. 5886 M) |
| E. H. Clamons<br>UNIVAC Division<br>Sperry Rand Corporation<br>P. O. Box 500<br>Blue Bell, Pennsylvania<br>Tel: 215 MI-6-9000 (Ext. 404) | None |
| J. F. Chesterman<br>Bell Telephone Labs (2F 517)<br>Holmdel, New Jersey<br>Tel: 201 949-3968 | None |
| L. L. Griffin<br>Navy Management Office<br>Navy Department<br>Washington 25, D.C.<br>Tel: 202 OX-6-7277 | None |
| R. M. Gryb<br>American Tel. & Tel. Co.<br>195 Broadway<br>New York, New York<br>Tel: 212 393-3671 | D. A. Kerr<br>American Tel. & Tel. Co.<br>195 Broadway - Room 1110<br>New York, New York<br>Tel: 212 393-3051 |

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11/28/62

# ESCAPE

## A SUMMARY OF TECHNICAL DETAILS DISCUSSED AT THE SEPTEMBER 1962 MEETING OF X3.2

(With liberal interpretation by Eric H. Clamons)

Before entering a discussion of Escape, it is necessary to define "Shift-in" and "Shift-out" for purposes of the following discussion, we assume the following definitions:

Shift-in (SI) standard graphic codes which follow a Shift-in code take on a new graphic meaning.

Shift-out (SO) terminates an alternate graphic sequence and returns the sequence to normal graphic meaning.

Note: 1. Only the dense graphic set is affected by SI and SO.

2. Only one alternate graphic meaning can be assigned.

Question: Should the alternate meaning be a users option?

### Discussion of Escape

The following points must be considered in detail before one can settle the definition of Escape:

1. It must be established whether the entire code set is to be modified by the Escape or whether only the control set is to be modified since Shift-in and Shift-out restricts itself to the graphic set only.

2. The Escape philosophy must allow Escape to binary sets and must in turn allow a binary set to return to normal.

3. The data security must be considered carefully since the loss of an existing escape condition is much more severe than the loss of a character. The question arises whether a status check should be introduced in order to ensure that the received data is in a mode other than the normal mode.

4. We must decide whether there is a need for multiple levels of Escape "cascading vs. arbitrary shift from one mode to another". Here the problem of ensuring that the desired level is transmitted must be considered.

5. We must determine whether there is a need for symmetry that is whether it is necessary to be able to enter an alternate mode both in the forward and reverse direction of character flow; i.e., tapes.

CBI 67/1/3

6. We must consider whether Escape is to be rigidly defined for both the original and the alternate sets or whether return from the alternate set is to be entirely up to the system using it. The latter requiring a much more flexible definition of return. Such a flexible definition will allow, i.e., a binary sequence to return to normal.

7. Finally we must determine whether a separate "Return from Escape" symbol is required.

Note: If a special "Escape Return" symbol or a flexible definition is a requirement (or if both are requirements) than the need far symmetry can be satisfied by introducing the Escape code immediately after return from the alternate system.

As part of our discussion we determined the most general form of Escape:

| | |
|---|---|
| X ------ | Is the Escape code of the PASCII. |
| Y ------- | Is a code of the PASCII, (yet to be defined) for altering or terminating a sequence. |
| $C_i$ | A code in an arbitrary sequence of characters of the PASCII set. |
| $C_i^K$ | A code in an arbitrary sequence of characters of the K<sup></sup>th alternate set. |
| $a_K$ | A specific (Kth) ~~closed~~ code in the PASCII set. |
| $a_i^K$ | A specific (i) closed code in the Kth alternate set. |
| $X, a_K$ | A sequence of two characters which denotes a shift to the Kth alternate set. |

$f_L(a_j^K)$ - - - - - The L^th function of a specific (j^th) code of the K^th alternate set; it is specified by the K^th set to signal a shift to the L^th set.

${}_pC_i$ Prescript denotes the p^th sequence.

$\Rightarrow$ Sequence to the left implies sequence to the right.

The most general form of Escape then takes on the form:

$$x, a_K, {}_pC_0, {}_pC_1, \ldots\ldots, {}_pC_N, f_L(a_j^K), {}_{p+1}C_0, {}_{p+1}C_1, \ldots \Rightarrow {}_pC_0^K, \ldots\ldots {}_pC_N^K, {}_{p+1}C_0^L, {}_{p+1}C_1^L \ldots$$

A series of less general forms can be stated:

1. $f(a_L^K)$ Shifts the sequence of the L^th set. (0 means blank and indicates shift to the PASCII).

$$x, a_K, {}_pC_0, {}_pC_1, \ldots {}_pC_N, f(a_L^K), {}_{p+1}C_0, {}_{p+1}C_1, \ldots \Rightarrow {}_pC_0^K, \ldots\ldots {}_pC_N^K, {}_{p+1}C_0^L, {}_{p+1}C_1^L \ldots$$

2. $f(a_j^K)$ Always returns the sequence to the PASCII set.

$$x, a_K, {}_pC_0, {}_pC_1, \ldots {}_pC_N, f(a_j^K), {}_{p+1}C_0, {}_{p+1}C_1 \ldots \Rightarrow {}_pC_0^K, \ldots {}_pC_N^K, {}_{p+1}C_0, {}_{p+1}C_1 \ldots$$

3. $f(a_L^K)$ Is reduced to $x \wedge y, a_L^K$. (subset of [illegible] 1).

$$x, a_K, {}_pC_0, \ldots\ldots {}_pC_N, x \wedge y, a_L^K, {}_{p+1}C_0, {}_{p+1}C_1 \ldots \Rightarrow {}_pC_0^K, \ldots {}_pC_N^K, {}_{p+1}C_0^L, {}_{p+1}C_1^L \ldots$$

4. $x \wedge y$ Returns to PASCII (subset of 2).

$$x, a_K, {}_pC_0, \ldots {}_pC_N, x \wedge y, {}_{p+1}C_0, {}_{p+1}C_1 \ldots \Rightarrow {}_pC_0^K \ldots {}_pC_N^K, {}_{p+1}C_0, {}_{p+1}C_1 \ldots$$

5. Escape operates only on one character with "Return of Escape" symbol.

$$x, {}_pC_0, x \wedge y, {}_{p+1}C_0, {}_{p+1}C_1 \ldots \Rightarrow {}_pC_0', {}_{p+1}C_0, {}_{p+1}C_1, \ldots$$

6. Escape function operates on one character function only.

$$x, {}_pC_0, {}_{p+1}C_0, {}_{p+1}C_1 \ldots \Rightarrow {}_pC_0', {}_{p+1}C_0, {}_{p+1}C_1, \ldots$$

Note: 1) Discussion with Mr Griffin disclosed a more general form

$$f_L(a_i^K, a_j^K, a_k^K \ldots)$$

However, Mr Griffin is inclined to favor a single fixed sequence: $[a_i, a_j, a_k, \ldots]$ to indicate end of alternate mode.

2) ISO/TC 97/WGE (USA-11) 56 p3,4 introduces the notion of counting the number of characters in the alternate set.

EHC/i
10-30-62

Alt IFIP {
1. "1+n" single deviation level applying to next "n" char
2 Lock " " " applying to all char until next lock
3. "1+m" Lock m " " " " " " " "

Also

Variation of 1. "1+m+n"

2. UC/LC [FS/LS of Baudot]

2. Flip Flop [ESCAPE causes entry into mode opposite to present]

2. Recursive, single character A → B → C → ... → A :

2 " two character [one causes exit to next of hierarchy, other is entry from prev. l.

Variations of 1. Deviation contains lock control.

" " 3 "Escape" same in all levels! [($2^n$-1) possible deviants if m is 1 pos

3 " to neutral Fixed organization for one or more (Fixed) char times. next identifies desired level, automatic exit from neutral mode. (one possibility within this org. is use of escape to identify base mode, providing better [illegible] for [illegible] systems (encryption!)

TELEGRAMS
DIGIT [illegible]
LONDON

TELEPHONE
LANGHAM 97[illegible]

FERRANTI LTD
ELECTRICAL & GENERAL ENGINEERS

21 PORTLAND PLACE
LONDON W1

441/HMcGR/CTJ

8th June, 1962

R.W. Bemer, Esquire,
Weston Road,
WESTON, CONN., U. S. A.

Dear Bob:

I have been interested to read your proposed definition of the Escape character, as given in the document ISO/TC 97/WG E (USA-11)56.

I am finding this hard to reconcile with the concept which most of us over here have had, which is that Escape signifies that the next single character may have a different meaning from that in a standard alphabet.

This seems to be similar to the first mode of usage which you illustrate, but with the differences that it relates only to one following character, and also that the following character may, not shall, be ~~f[illegible]~~ from the alternative alphabet (the latter point is to cover the case where a user wishes to retain the "ordinary" meaning of the following character, and it corrects an unnecessary restriction which we put into the British Standard Code, BS 3480, Section 5).

It is, of course, open to the user to specify that the single following character means "go into an alternative alphabet and stay in it". I feel that this is much preferable to your suggested second mode of usage, which, to my mind, is only equivalent to a "Switch Shift" command. I feel it could only lead to confusion if, sometimes, Escape and its following character are used to affect the change; while, on other occasions, Escape alone affects the change.

I believe your third mode of usage comes directly out of my definition merely by specifying the following character.

I have found it useful to emphasise that the use of this Escape technique invariably requires an agreement between the initiator and recipient of a coded message, what the CCITT call a 'bilateral agreement'. This agreement, however, can be entirely independent of anything in the standard alphabets, and it does not require the co-operation of any third party who may wish to use the following character with some different meaning. Allthat is required is that, in every alphabet which uses

2/. . . .

the technique, the same code combination should be used for Escape.

I would be very grateful to hear whether you feel this interpretation of the Escape concept is correct, and whether it is adequate for the more important applications which you envisage. I am sure that if a mutual understanding of the concept is established, then a Glossary definition could easily be worked out.

Yours sincerely,

H. McG. Ross
Computer Sales Department

TECHNICAL COMMITTEE 97 COMPUTERS AND INFORMATION PROCESSING

Working Group E Programming Languages

Reference: ISO/TC 97/WG E (USA-3) 22.

Subject: Programming language implications on coded character sets

Gentlemen:

A. The following points of consideration are proposed as a basis for study of character sets, as proposed by WG B and others, with regard to their suitability from a programming language viewpoint:

1. Are the sets capable of graduated size by means of regular and clearly defined rules of expansion?

2. What sizes are of particularly concern to programming language needs?

| | |
|---|---|
| 4 - BIT | 16 |
| 5 - BIT | 32 |
| 6 - BIT | 64 |
| 7 - BIT | 128 |
| 8 - BIT | 256 |
| others? | |

3. What is the preferential ordering of graphics for inclusion in sets of varying size?

4. Are there natural orderings of Sub Groups of graphics which should be reflected in the coded representations? Are there artificial orderings which have caused unnecessary constraints?

5. Are control characters the concern of programming languages, as well as information characters?

6. Are there defined correspondences between multiple character symbols used with smaller sets and the single characters available in larger sets? Is there a controlled pattern of replacement with increasing set size? For example, single characters for ALGOL word symbols, or multiple symbols such as ← for :=, ∧ for / \.

7. Are criteria specified for controlled future expansion and addition?

8. Is an "escape character" provided to allow for usage of alternate, specialized character sets? What graphic subsets should remain in common positions in alternate sets so that they may be uniquely recognizable?

9. What values following the escape character (see section B of this document) should be reserved for specialized character sets for programming languages?

10. What control considerations are necessary to utilize alternate or graduated equipments?

11. Are sufficient data delimiters included in sets (of sufficient siz ) to adequately indicate set membership in data groups?

12. Are sufficient delimiters included in sets (of sufficient size) to adequately indicate syntactic grouping?

13. What characters are required to map two-dimensional flowcharts into one-dimensional string languages? For example, a character signifying "is inside of", and characters for the shaped elements and flow lines.

14. Are the character sets equally applicable to conventional von Neumann machines and streaming (or other types of non-von Neumann) machines?

B. From the attached (proposed) IFIP definition of "escape character" it may be seen that it is possible to have many compatible alphabets within the framework of an international character set and code. The imminence of such a standard interchange code and the existing problem of interchange of algorithms suggest that the time is proper for some advanced planning in the area of characters used in programming languages.

It is proposed that a tentative group of characters (to follow the escape characters) be reserved to indicate special alphabets for programming languages. Further, work should begin at once on a specific alphabet for interchange of ALGOL and COBOL programs.

It is advisable that a generally agreed upon nucleus of graphic assignments (e.g., common to the ECMA BSI and ASA draft codes))be retained in the programming set. Also those ALGOL and COBOL graphics defined in any of these sets should be preserved. Consideration should then be given to adding the rest of the ALGOL characters, in particular reserving positions for the "complete word" characters of ALGOL. Among the further graphics which may be considered are those likely to have special usage stemming from mathematics and logics, delimiters which imply set membership hierarchy, delimiters for syntactic entities such as phrases, flow chart symbols, etc.

R. W. Bemer

Howard Bromberg
U.S. Representative
ISO/TC 97/WG E

22105.3 ESCAPE CHARACTER (Excerpted from the Provisional IFIP Glossary)

A character, the representation of which, when occurring, in a time sequence of characters, initiates a (temporary) change in system organizaton, particularly the assignment of new graphics and meanings to the coded representations. Three modes of usage are possible, as illustrated in the figure:

1. A specified number (commonly only one) of characters immediately following the escape character are to be from an alternative alphabet. This is similar to the action of the non-locking shift key on a typewriter.

2. All characters following the escape character are from an alternative alphabet until the escape character representation of that alphabet is encountered. Reversion is then made to the original alphabet. This is similar to the locking shift key (and unlocking) on a typewriter.

3. The character immediately following the escape character determines which of $2^N - 2$ alternative alphabets (where $N$ = the number of bits in a character representation) are in force until the next escape character representation is encountered. This process is recursive and thus any of the $2^N - 1$ alphabets (see Note 3) may be invoked by the escape character each time, including the alphabet just used.

Note 1. For logical and equipment purposes, it may be convenient, in the second and third cases for the escape character representation to be identical in all alphabets.

Note 2. Either one, two or three individual escape character representations may be reserved in a set and assigned to any of the three modes given.

Note 3. Alternative alphabets are limited to $2^N - 1$ in number so that the repetition of the escape character itself may be reserved to additional purposes, rather than calling its own alphabet.

Time __________

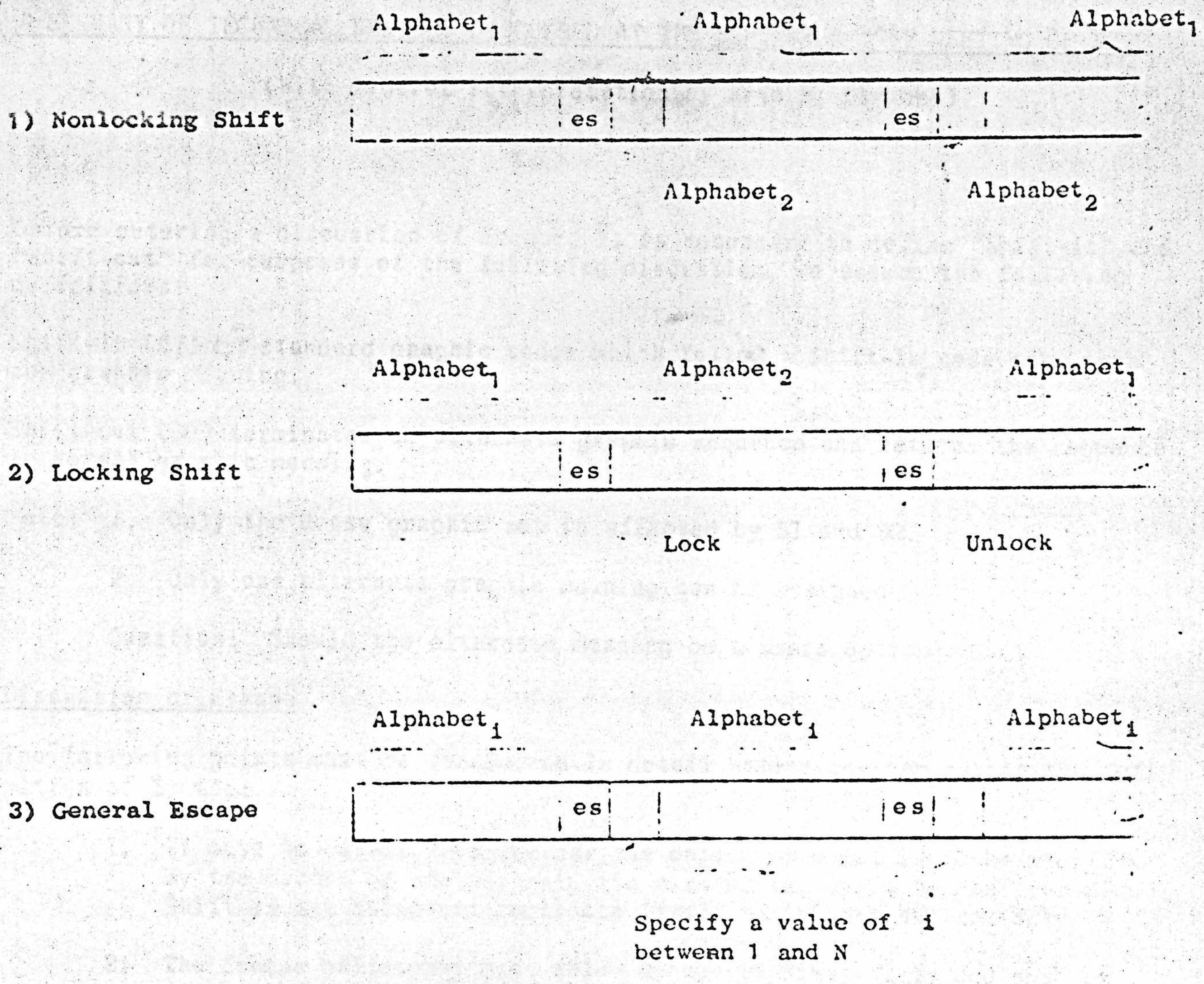

Figure Illustrating "ESCAPE CHARACTER"

Ccca
[illegible]

September 17, 1962

Mr. J. Besseyre, Senior Counsellor
International Telegraph and Telephone
Consultative Committee
2 rue de Varembe
Geneva 20, Switzerland

Dear Mr. Besseyre:

This is with reference to questions 1/A, 6/I, 8/VIII, your document dated July 9, 1962. This document suggested a statement of opinions with respect to the choice of a "new alphabet for the transmission of data". The following comments and opinions should be construed only as a reflection of the views of the American Telephone and Telegraph Company and are not purported to represent a national position.

Representatives of the American Telephone and Telegraph Company have collaborated closely with the various groups in the United States and Europe (ECMA-ISO) which have been actively working towards the standardization of a new code (coded character set) for general information interchange. As a result of this work, the new 4-row 100 wpm teletypewriters which are being offered with our TWX and WADS service late this year will employ a code which is essentially in agreement with the code proposed by Subcommittee X3.2 and approved by Sectional Committee X3 of ASA.

Attached is a copy of the code which the Bell System is implementing on new teletypewriters. You will note that this code is substantially in agreement with Proposal B as contained in your July 9th document, with the exception of an interchange in position between two pairs of symbols * and :, + and ;. It is expected that these differences will be eliminated at the forthcoming meeting of ISO Working Group B in Paris in October. An additional difference is that the character which is called Acknowledge in the ASA code, which we have elected to call Confirmation, does not appear in Proposal B. Further, we have made discrete assignments for $DC_1$- $DC_4$.

We believe the attached code, which we in the Bell System currently refer to as Data Interchange Code, is a good code for use in teletypewriter communications, and also a good code for general information interchange (including physical media) between data processing equipments and systems, components of which may be provided by different suppliers. We would favor the international standardization of this code.

NMAH 310/3

and

The attached code differs in several respects from that which I sent to you with my letter of December 8, 1961, and which you distributed to Study Groups I, VIII, and SP.A (Contribution #35) on January 22, 1962. These differences, which are a result of domestic European review and negotiation, are principally in the structure of the control functions and arrangement of symbols; the alphas and numerics remain unchanged. We have made these changes in our plans, for implementing the new teletypewriters, in concert with what we judged to be the latest view of the national and international standardization efforts. Much work remains to be done. Although the basic structure is sound, minor rearrangements might be expected. Work remains to be done on the unassigned area, escape philosophy, code representation in media, and related subset and supersets.

It would be beyond the scope of this letter to outline all of the reasons for our choice of this code. However, this decision was made only after much study and careful deliberation. We would expect that the transition in usage from existing codes, such as in our existing TWX service, would occupy a period of about five years, perhaps longer. Further, we expect that the data processing manufacturers will go through a similar period of transition - if we are ever to arrive at a single universal, widely-used code. The time required might even be longer in their case. I would fully expect that a longer time would be required in Europe before Telex communications could be changed to a new code. Perhaps the approaches that we are using, to make an economic transition from our existing five unit teletypewriter code to the new code, will be of interest to CCITT and I will be glad to elaborate upon them in the future.

Yours very truly,

(Signed) V. N. Vaughan, Jr.

VNV:bw

Attachments

# KEYBOARD GENERATED CODE SEQUENCES

|  |  |  | Code Sequence - Numbers Indicate Marking Bits |  |  |  |  |  |  |  |
|---|---|---|---|---|---|---|---|---|---|---|
| Primary | With Shift | With Control** | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| A |  |  | 1 |  |  |  |  |  | 7 | 8th Bit Always Marking |
|  |  | SOM* | 1 |  |  |  |  |  |  |  |
| B |  |  |  | 2 |  |  |  |  | 7 |  |
|  |  | EOA* |  | 2 |  |  |  |  |  |  |
| C |  |  | 1 | 2 |  |  |  |  | 7 |  |
|  |  | EOM* | 1 | 2 |  |  |  |  |  |  |
| D |  |  |  |  | 3 |  |  |  | 7 |  |
|  |  | EOT |  |  | 3 |  |  |  |  |  |
| E |  |  | 1 |  | 3 |  |  |  | 7 |  |
|  |  | WRU | 1 |  | 3 |  |  |  |  |  |
| F |  |  |  | 2 | 3 |  |  |  | 7 |  |
|  |  | RU |  | 2 | 3 |  |  |  |  |  |
| G |  |  | 1 | 2 | 3 |  |  |  | 7 |  |
|  |  | Bell | 1 | 2 | 3 |  |  |  |  |  |
| H |  |  |  |  |  | 4 |  |  | 7 |  |
| I |  |  | 1 |  |  | 4 |  |  | 7 |  |
|  |  | Tab | 1 |  |  | 4 |  |  |  |  |
| J |  |  |  | 2 |  | 4 |  |  | 7 |  |
| K |  |  | 1 | 2 |  | 4 |  |  | 7 |  |
|  | [* |  | 1 | 2 |  | 4 | 5 |  | 7 |  |
|  |  | VT | 1 | 2 |  | 4 |  |  |  |  |
| L |  |  |  |  | 3 | 4 |  |  | 7 |  |
|  | *** |  |  |  | 3 | 4 | 5 |  | 7 |  |
|  |  | Form |  |  | 3 | 4 |  |  |  |  |
| M |  |  | 1 |  | 3 | 4 |  |  | 7 |  |
|  | ]* |  | 1 |  | 3 | 4 |  |  |  |  |
| N |  |  |  | 2 | 3 | 4 |  |  | 7 |  |
|  | ↑ |  |  | 2 | 3 | 4 | 5 |  | 7 |  |
| O |  |  | 1 | 2 | 3 | 4 |  |  | 7 |  |
|  | ← |  | 1 | 2 | 3 | 4 | 5 |  | 7 |  |
| P |  |  |  |  |  |  | 5 |  | 7 |  |
|  | @ |  |  |  |  |  |  |  | 7 |  |
| Q |  |  | 1 |  |  |  | 5 |  | 7 |  |
|  |  | X On* | 1 |  |  |  | 5 |  |  |  |
| R |  |  |  | 2 |  |  | 5 |  | 7 |  |
|  |  | Tape (R, On) |  | 2 |  |  | 5 |  |  |  |
| S |  |  | 1 | 2 |  |  | 5 |  | 7 |  |
|  |  | X Off | 1 | 2 |  |  | 5 |  |  |  |
| T |  |  |  |  | 3 |  | 5 |  | 7 |  |
|  |  | TAPE (R, Off) |  |  | 3 |  | 5 |  |  |  |
| U |  |  | 1 |  | 3 |  | 5 |  | 7 |  |
| V |  |  |  | 2 | 3 |  | 5 |  | 7 |  |
| W |  |  | 1 | 2 | 3 |  | 5 |  | 7 |  |
| X |  |  |  |  |  | 4 | 5 |  | 7 |  |
| Y |  |  | 1 |  |  | 4 | 5 |  | 7 |  |
| Z |  |  |  | 2 |  | 4 | 5 |  | 7 |  |
| 0 |  |  |  |  |  |  | 5 | 6 |  |  |
| 1 |  |  | 1 |  |  |  | 5 | 6 |  |  |
|  | ! |  | 1 |  |  |  |  | 6 |  |  |
| 2 |  |  |  | 2 |  |  | 5 | 6 |  |  |
|  | " |  |  | 2 |  |  |  | 6 |  |  |
| 3 |  |  | 1 | 2 |  |  | 5 | 6 |  |  |
|  | # |  | 1 | 2 |  |  |  | 6 |  |  |
| 4 |  |  |  |  | 3 |  | 5 | 6 |  |  |
|  | $ |  |  |  | 3 |  |  | 6 |  |  |
| 5 |  |  | 1 |  | 3 |  | 5 | 6 |  |  |
|  | % |  | 1 |  | 3 |  |  | 6 |  |  |
| 6 |  |  |  | 2 | 3 |  | 5 | 6 |  |  |
|  | & |  |  | 2 | 3 |  |  | 6 |  |  |
| 7 |  |  | 1 | 2 | 3 |  | 5 | 6 |  |  |
|  | ' |  | 1 | 2 | 3 |  |  | 6 |  |  |
| 8 |  |  |  |  |  | 4 | 5 | 6 |  |  |
|  | ( |  |  |  |  | 4 |  | 6 |  |  |
| 9 |  |  | 1 |  |  | 4 | 5 | 6 |  |  |
|  | ) |  | 1 |  |  | 4 |  | 6 |  |  |
| : |  |  |  | 2 |  | 4 | 5 | 6 |  |  |
|  | * |  |  | 2 |  | 4 |  | 6 |  |  |
| ; |  |  | 1 | 2 |  | 4 | 5 | 6 |  |  |
|  | + |  | 1 | 2 |  | 4 |  | 6 |  |  |
| , |  |  |  |  | 3 | 4 |  | 6 |  |  |
|  | < |  |  |  | 3 | 4 | 5 | 6 |  |  |
| - |  |  | 1 |  | 3 | 4 |  | 6 |  |  |
|  | = |  | 1 |  | 3 | 4 | 5 | 6 |  |  |
| . |  |  |  | 2 | 3 | 4 |  | 6 |  |  |
|  | > |  |  | 2 | 3 | 4 | 5 | 6 |  |  |
| / |  |  | 1 | 2 | 3 | 4 |  | 6 |  |  |
|  | ? |  | 1 | 2 | 3 | 4 | 5 | 6 |  |  |
| Space |  |  |  |  |  |  |  | 6 |  |  |
| Ret (CR) |  |  | 1 |  | 3 | 4 |  |  |  |  |
| LF |  |  |  | 2 |  | 4 |  |  |  |  |
| Alt Mode |  |  | 1 |  | 3 | 4 | 5 | 6 | 7 |  |
| Rub OUT |  |  | 1 | 2 | 3 | 4 | 5 | 6 | 7 |  |

* Not shown on key tops.

** Tape printing machine print associated primary codes in red on control operation. Example, Control-D (EOT) will print a red D. Page machines suppress printing on controls.

*** Blocked on early model keyboards - not shown on keytop.

Attachment F-1

# DATA INTERCHANGE CODE

7th bit – Control
6th " – symbol shift

|  | BIT NUMBERS<br>765 |  |  |  |  |  |  |  |
|---|---|---|---|---|---|---|---|---|
| BERS<br>321 | 000 | 001 | 010 | 011 | 100 | 101 | 110 | 111 |
| 0000 | NULL |  | SPACE | 0 | @ | P |  |  |
| 0001 | SOM | XON | ! | 1 | A | Q |  |  |
| 0010 | EOA | RION | " | 2 | B | R |  |  |
| 0011 | EOM | XOFF | # | 3 | C | S |  |  |
| 0100 | EOT | RIOF | $ | 4 | D | T |  |  |
| 0101 | WRU | ERROR | % | 5 | E | U |  |  |
| 0110 | RU | SYN | & | 6 | F | V |  |  |
| 0111 | BELL | LEM | ' | 7 | G | W |  |  |
| 1000 |  | S0 | ( | 8 | H | X |  |  |
| 1001 | HTAB | S1 | ) | 9 | I | Y |  |  |
| 1010 | LF | S2 | * | : | J | Z |  |  |
| 1011 | VTAB | S3 | + | ; | K | [ |  |  |
| 1100 | FF | S4 | , | < | L | \ |  | CONF |
| 1101 | CR | S5 | − | = | M | ] |  | ALT MODE |
| 1110 | SO | S6 | . | > | N | ↑ |  | ESC |
| 1111 | SI | S7 | / | ? | O | ← |  | DEL |

Attachment F-2

## ISO/TC 97 WG B

## THIRD MEETING, PARIS - 8 & 9, OCT. 1962

Present:
France
Germany
Netherlands
Japan
Italy
United Kingdom
United States of America

### Summary

A detailed list of those present is contained in the appendices.

The following actions were taken by Working Group B during the course of its meeting.

1. Resolved to request the ISO/TC 97 to circulate as a draft proposal for comment a set of related 6 and 7 bit codes. This circulation was subsequently approved by the ISO/TC 97. The 7 bit set of the draft proposal is essentially identical with the 7 bit set of the proposed ASCII, contained in Document X3.2/13, dated September 10, 1962.
2. Resolved that its scope include responsibility for the representation of codes in the several media. This resolution was also approved in the ISO/TC 97 Plenary Session.
3. Adopted a resolution setting forth its scope and future work program.
4. Met with Working Group E, Programming Language, to discuss matters of mutual interest and agreed to consider Working Group E's comments on the draft proposal.

These resolutions are stated in full in the appendix as part of ISO/TC 97 WG B, Document 31, report of the Chairman of the WG B to the Plenary Committee.

At its second meeting in May, 1962, the Working Group resolved that it should become a Subcommittee. At the Plenary Session on October 17 & 18, ISO/TC 97 gave the Working Group the status of Subcommittee No. 2.

### General

The Chairman welcomed the group in the name of the Director General of AFNOR and devoted some remarks to procedural matters. The minutes of the prior meeting were approved with minor comments by the U.S. delegates. The drafting committee, consisting of Messrs. Griffin, Durand, Chadwick and Cluff was appointed.

UMAH 310/4

Two documents were submitted to the group. One, a United Kingdom proposal on machine tool control codes was placed on the agenda. The other, a similar document from ISO/STACO (Poland) which dealt with the need for machine tool control code standardization was also entered on the record. Both are reproduced in the appendix.

Discussion of replies to the questionnaire on the acceptability of Proposal B, a 7 bit code with related 6 bit set ensued. All countries except Germany favored Proposal B but all had certain minor comments and modifications to offer. The ECMA also favored general approval. Italy specified that its approval was conditioned on the requirement that the 6 and 7 bit codes should be considered equal. The United States and UIC favored adoption of the 7 bit proposal alone.

Germany did not approve Proposal B because the SPACE (all 0's) code of the 6 bit set would cause difficulty in their TELEX network. This objection was supported by representatives of the CCITT.

The representatives of the CCITT stated that they looked with great interest upon the work of ISO/TC 97 but that in the matter of codes the final responsibility for a telegraph as opposed to data processing code alphabet lay with the CCITT. They emphasized that the work of WG B would be of great importance to the CCITT effort.

The representative of the Netherlands pointed out that they had recently joined the coding effort and were not in the position to make firm comments. However, he observed that the incompatibility of Proposal B with both the TELEX code and with codes associated with existing storage media, such as punched cards and tape could raise many problems.

The representative of Japan stated that there were 45 characters in the Kata Kana alphabet and that he therefore saw some difficulties with the present proposal.

After much discussion areas of disagreement in detail among those agreeing in principle were identified and a number of task groups set up to resolve the difficulties. The code proposal and the statement of scope in the appendix were the result of the work of these task groups.

Still another task group was set up to prepare for the meeting with Working Group E, Programming Language.

Working Group B voted to pass the code to the Plenary Session for circulation. In addition, it voted that its scope include the implementation of codes in the media.

The meeting terminated with the decision to hold the next meeting in approximately one year, the exact date to depend on what date ISO/TC 97 requires replies to the draft code proposal.

At a joint meeting with Working Group E, on October 13, 1962, extensive discussion of coding requirements for Programming Language was held. Working Group E presented the following resolution to the Joint Session:

> Besides 26 letters and 10 digits, Working Group E considers the following set of 16 graphic characters as absolutely necessary:
>
> | | | | |
> |---|---|---|---|
> | 1. | Blank (space) | 9. | ' (apostrophe) |
> | 2. | + | 10. | : |
> | 3. | - | 11. | ; |
> | 4. | * | 12. | ( |
> | 5. | / | 13. | ) |
> | 6. | ≑ | 14. | [ |
> | 7. | . (period) | 15. | ] |
> | 8. | , (comma) | 16. | (currency sign) |
>
> Given a 64 character set, this still leaves room for 12 further control and/or commercial characters, such as % ¤ #

Working Group B observed that all of these signs were available in Proposal B. It was left that further mutual cooperation would be required between the two groups especially with respect to the definition of the Escape Function. The resolution contained as Annex 2 in the WG B Chairman's report was passed in the joint meeting.

J. F. AUWAERTER
U.S. Representative
to ISO/TC 97/WG B (now SC2)

---

I S O

ORGANISATION INTERNATIONALE DE NORMALISATION
INTERNATIONAL ORGANIZATION FOR STANDARDIZATION

Association Française
de Normalisation (AFNOR)
23, rue N.D.-des-Victoires
PARIS 2°
Tél. CEN 95-80

ISO/TC 97/WG B
CHARACTER SETS AND CODING

Secretariat :

ISO/TC 97 / WG B
(Paris 1962 -4)

31

October 1962

## REPORT OF THE CHAIRMAN
## OF THE W.G. B TO THE PLENARY COMMITTEE

Working Group B which had held a short introductory meeting at the time of its creation in Geneva 1961, and held a second meeting on the 2nd to 4th May 1962 in Paris, then a third one on the 8th and 9th October in Paris under the chairmanship of Mr. Feissel.

At the May meeting alternative proposals, A and B, on two related 6 and 7 bit codes were considered. Table B which was given preference by the majority of the delegates present at the meeting is the result of a compromise proposed by several delegations.

The Working Group then agreed that a written enquiry should be conducted and requested its P members to let the Secretariat know whether they were in favour of the proposal B or not by September 15th, 1962.

From May to July, AFNOR received answers from Germany, Belgium, the United Kingdom, the U.S.A., UIC and ECMA.

In July, the Secretariat recorded the admission of a new member, the Netherlands.

The meeting in October 1962 was essentially devoted to the preparation of an amended first draft proposal for 6 and 7 bit codes derived from table B and allowing for the answers received and the new discussions. This document was given the reference number ISO/TC 97/WG B (Secretariat 12)30.

Consequently, the Chairman of the Working Group has the honour to submit the following resolution to the Plenary Committee :

...../.....

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## EXTRACTS FROM PAGE 2 OF REPORT TO THE CHAIRMAN

### Draft Resolution No. 1

ISO/TC 97 approves the circulation of document ISO/TC 97/WG B (Sec. 12)30 as a draft proposal through the TC Secretariat to :

a/ - the members "P" and "O" of ISO/TC 97

b/ - all ISO/TC 97 Working Groups

c/ - the Secretariat of ISO/TC 95 and more especially to Working Group H

d/ - the Secretariat of ISO/TC 39 "Machine Tools"

e/ - the international organizations and especially CCITT, ECMA, UIC.

ISO/TC 97 asks the Secretariat to convey to the Secretariat of WG B all the comments it receives from the member countries and other organizations to which the draft will have been sent in order to allow the WG to consider them.

> Resolution No. 1 was approved by the Plenary Session by a vote of 7 to 1, Germany casting the sole negative vote.

### Principle Other Decisions

- ------

2/ - Transmission

Representatives from CCITT attended the meeting of Working Group B on October 8th and 9th and gave very precise indications on the proposition of this international organization.

Moreover the Secretariat of WG B was apprised of the schedule of WG F at its meeting on October 11th and 12th (Doc.ISO/TC 97/WG F (USA 3)27), the items 7 and 11 of which arrested its attention and will induce it to take all required initiative for a liaison.

- ------

### International Organizations

In addition to the above-mentioned contribution of CCITT Working Group B welcomed the very active and constructive participation of representatives from ECMA and UIC.

---

I S O
ORGANISATION INTERNATIONALE DE NORMALISATION
INTERNATIONAL ORGANIZATION FOR STANDARDIZATION

Association Française
de Normalisation (AFNOR)
23, rue N.D.-des-Victoires
PARIS (2e)

Tél. : CEN. 95-80

ISO/TC 97
CALCULATEURS ET TRAITEMENT DE L'INFORMATION
Secrétariat :
U.S.A.

ISO/TC 97
(Paris 1962-1) 38

Octobre 1962

## DEUXIEME REUNION DU COMITE PLENIER ISO/TC 97

### PARTICIPATION ANNONCEE

| | |
|---|---|
| **BELGIUM :** | |
| M. A. TSOVIANOFF | attaché de Direction à la S.A. Caisses Enregistreuses "National" |
| **FRANCE :** | |
| MM. FRONTARD | Directeur à l'AFNOR |
| DUPIN de SAINT-CYR | Association Professionnelle des Banques |
| FEISSEL | Ingénieur à la Compagnie des Machines BULL |
| GUILHAUMOU | Ingénieur à la Compagnie IBM-FRANCE |
| HARRAND | Société Européenne de Traitement de l'Information |
| HENRY | Ingénieur à l'Electricité de France |
| THIARD | Centre National de l'Automatisation |
| X .... | Union Technique de l'Electricité |
| **GERMANY :** | |
| MM. GOSSLAU | Dr, Siemens & Halske, Munich |
| BASTEN | dipl.-Math., Telefunken, Konstanz |
| DIETRICH | Dr, Standard Elektrik Lorenz, Stuttgart-Zuffenhausen |
| LOCKEMANN | Dr, Siemens & Halske, Munich |
| MOHR | Dipl.-Ing., Deutscher Normenausschuss, Berlin |
| IHACZEK | Dr, Remington Rand Univac, Frankfurt am Main |

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.../...

JAPAN :

| | |
|---|---|
| M. Hidetoshi TAKAHASHI | University of Tokyo |

NETHERLANDS :

| | |
|---|---|
| MM. Prof. L. W. VAN DER POEL | PTT, Dr. Neherlab, Leidschendam |
| Dr M. R. MANTZ | Bull Nederland, Amsterdam |
| R. J. VAN BIENE | Netherlands Information Processing Research Center<br>Amsterdam. |

SWEDEN :

| | |
|---|---|
| MM. BRICKNER | Systems Manager, AB Addo, Malmo |
| JONSON | Actuary, Swedish Board for Computing Machinery,<br>Stockholm |
| Dr. E. STEMME | Doctor of Technology, Facit Electronics, Solna |
| S. OFVERBERG | Manager of Advanced Market Development, IBM<br>Stockholm |

SWITZERLAND::

| | |
|---|---|
| M. P. NAVET | European Director, Product Planning Accounting<br>Machines and Electronics, Caisses Enregistreuses<br>National S.A., Zurich |

UNITED KINGDOM :

| | |
|---|---|
| MM. G. WESTON | Associate Director, BSI |
| G. CHADWICK | Senior Technical Officer, BSI |
| E. G. CLUFF | Standards Coordinator, I.C.T. Limited |
| L. R. CRAWLEY | Information Processing Division S.T. & C Ltd |
| W. EADIE | Standards Coordinator, IBM (UK) Ltd |
| P. HALL | I.C.T. Ltd |
| H. McG. ROSS | in charge of Ferranti Computer Section |
| J. R. W. SMITH | Chief Mathematician, British Telecommunications<br>Research Ltd |
| P. J. THOMAS | I.C.T. Ltd |

U.S.A. ;

| | |
|---|---|
| MM. Brian W. POLLARD | Burroughs Corporation, Detroit |
| John F. AUWAERTER | Director of Product Development, Teletype Corp.<br>Sckkie Illinois |

.../...

| | |
|---|---|
| MM. R. E. BLUE | IBM Corporation, General Products Division<br>White Plains, N.Y. |
| H. BROMBERG | Radio Corporation of America, Camden 8, N.J. |
| Dr R. F. CLIPPINGER | Minneapolis-Honeywell Regulator Co, EDP Division<br>Wellesley Hills 91, Massachusetts |
| Mr R. J. MINDLIN | Product Planning, National Cash Register Company<br>Dayton 9, Ohio |
| C.A. PHILLIPS | Director, Data Processing Group,<br>Business Equipment Manufacturers<br>Assn., New-York 17 |
| E. D. SPINA | IBM Corporation, General Products Division<br>Department 441, Product Planning Laboratory<br>Endicott, N.Y. |
| A. H. STILLMAN | Radio Corporation of America, Camden 8, N.J. |
| F. W. WARDEN | Dept. 971, IBM Corporation, Poughkeepsie, N.Y. |

LIAISON TECHNICAL COMMITTEES AND INTERNATIONAL ORGANIZATIONS :

| | |
|---|---|
| ISO/TC 6, Paper | M. BLONDOT, Engineer at AFNOR |
| ISO/TC 39, Machine Tools | M. PALLEZ, Engineer at AFNOR |
| ISO/TC 68, Banking | M. GARRIVIER, Secy du Comité d'Etudes Techniques<br>et de Normalisation Bancaire |
| ISO/TC 95, Office Machines | M. Luciano ZANNINI<br>Olivetti Bull Co |
| IEC/TC 53, Computers and Information Processing | Dr A. B. CREDLE, Chairman IEC/TC 53 |
| Centre International de Calcul (CIC) | Jean BESS, CIC Asst. Dir. |
| Comité Permanent des Congrès Internationaux d'Actuaires (CP CIA) | J. ENGELFRIET de Wassenaar (Hollande) |
| European Computer Manufacturers Association | C. G. HOLLAND-MARTIN (Head)<br>I.C.T. Ltd, London |
| | D. HEKIMI (Secretary)<br>Secy-Gen. of ECMA, Geneva |
| | Prof. Dr. J. ENGELFRIET, N.V. Electrologica,<br>The Hague |
| Fédération Internationale de Documentation | Mme POYEN |

.../...

| | |
|---|---|
| International Federation ~~of~~ for Information Processing | R. G. BASTEN<br>J. BESSE<br>M. PACELLI<br>W. L. VAN DER POEL<br>G. C. TOOTILL<br>A. R. WILDE<br>H. ZEMANEK (Dr.) |
| Union Internationale des Chemins de Fer (UIC) | M. P. BIENFAIT, Ingénieur à la Société Nationale des Chemins de Fer Belges, Bruxelles |
| Union Internationale des Télécommunications (UIT) | |
| - International Radio Consultative Committee (CCIR) | Hervé POULIQUEN, CCIR |
| - International Telegraph and Telephone Consultative Com. (CCITT) | J. BESSEYRE, Conseiller supérieur du CCITT<br>J. RHODES, Rapporteur principal de la commission spéciale A du CCITT, Telegraph Branch, London |

SECRETARIAT (American Standards Association)

MM. V. G. GREY
W. E. ANDRUS, Jr
R. G. CHOLLAR
R. E. UTMAN

INTERPRETER :

Mme UMANSKY

---

ISO/TC 97/WG E (PARIS 4) 92 E
9 October 1962

ISO - INTERNATIONAL ORGANISATION FOR STANDARDIZATION
TC 97 - Computers and Information Processing
Working Group E - Programming Languages

Date : October 9, 1962

Subject : Character set Resolution to Working Group B

Working Group E ~~The ad-hoc on character sets~~ presents the following resolution for submission to the joint session of Working Group B and Working Group E :

X Besides 26 letters and 10 digits, Working Group E considers the following set of 16 graphic characters as absolutely necessary :

1. Blank Space
2. +
3. -
4. *
5. /
6. =
7. . (period)
8. , (comma)
9. ' (apostrophe)
10. :
11. ;
12. (
13. )
14. [
15. ]
16. (Currency Sign)

Given a 64 character set, this still leaves room for 12 further control and/or commercial characters, such as %, [illegible], # → ¤

It is recommended that substitute characters should not be allowed in the standard.

| | |
|---|---|
| M. COOK | IFIP |
| M. GUMIN | Germany |
| W. Mc CLELLAND | U.S.A. |
| M. PEARSON | U.K |
| M. PICCIAFUOCO | Italy |
| M. van der POEL | Netherlands |
| R. CLIPPINGER, WG E Chairman, and ex-officio member | |

U/msm
Arc. : 2 045 E

WG B told WG E that ! " # ? @ ↑ ← were 7 symbols which should be the first to be replaced if necessary for programming languages.

IBM

112 East Post Road
White Plains, New York
WHite Plains 9-1900 (Area Code 914)

*International Business Machines Corporation*

October 11, 1962

Business Equipment Manufacturers Association
DPG Engineering Committee
235 East 42nd Street
New York 17, New York

Gentlemen:

On August 17, we wrote to your committee again stating IBM's strong endorsement for a standard code for the data processing industry -- a code that would enable users to intercommunicate with each other and to integrate equipment of different manufacturers in a given installation.

It was with great regret that, at the same time, we abstained from voting on the Proposed American Standard Code for Information Interchange, identified as document X3. 2/4. In accordance with ASA procedures, we offer our reasons for abstention with a summary history of our activity with the technical X3. 2 subcommittee.

During the early phases of the X3. 2 Code development, we made available to the X3. 2 subcommittee IBM technical personnel who actively participated in the development of this code and, in fact, endorsed it in concept. As time progressed, the product of this technical subcommittee was submitted to our systems and application people for evaluation of its effect in the market place. Because of their input, IBM advised the subcommittee as early as September, 1961, continuing through June, 1962, that this code represented such a complete break from existing codes that its adoption would be unnecessarily expensive to the user. It is our belief that the conversion costs will so inhibit the code's adoption that its value as a standard may never materialize. This evaluation was the basis for our negative vote in June of this year.

We immediately had our people develop the specifications for a type of standard code which could be adopted more readily -- a code which is a derivative of existing codes used by most manufacturers and which permits transition to a standard code at a minimum cost to users and manufacturers. We submitted our recommendations to your committee in August, 1962, urging an evaluation of the suggested derivative type code and, more particularly, the cost of adopting the suggested X3. 2 code to the users.

NMAH 3/0 /4

We find it necessary to continue to abstain from voting on the X3. 2 Code until our above requests of August 17 are acted upon.

Since we strongly endorse the adoption of a standard code for our industry, be assured that if BEMA will not act upon our requests, and if the X3. 2 Code is issued as an American Standard by ASA, IBM will cooperate, making the code available where the economic disadvantages to IBM customers are not a factor.

Very truly yours,

WEAndrus Jr

W. E. Andrus, Jr.
Group Director of Standards

WEA:mrs

cc: Mr. C. A. Phillips

DEPARTMENT OF DEFENSE
UNITED STATES OF AMERICA

DEPARTMENT OF THE NAVY
NAVY MANAGEMENT OFFICE
WASHINGTON 25, D. C.

DPSD:LLG:bls
25 October 1962

MEMORANDUM FOR MEMBERS, ALTERNATES AND CONSULTANTS OF ASA SUBCOMMITTEE X3.2

Subj: Additional information agenda for 31 October, 1 and 2 November meeting

1. The attached memorandum was received from Mr. S. Porter with a request that the subject be discussed at this meeting. I believe it falls within the proposed agenda previously forwarded. Discussion of the subject probably will not begin until 1 November. Mr. Porter plans to attend this meeting.

2. The X3.1 Subcommittee at their meeting on 24 October passed a resolution to the effect that X3.2 consider placing the 4 special characters included in their current OCR numeric set, in the last 4 positions in the numeric column of the proposed ASC II. A representative of X3.1, Mr. C. C. Heasley of Farrington Electronics Inc., will attend the X3.2 meeting on 1 November to discuss the requirements for these special characters.

3. Since forwarding the proposed agenda, I have talked with Mr. Turner of NASA. He has a concept he wishes to present and I suggested 1 November.

4. It looks like we will have a full schedule for the 3 days.

Regards,

L L Griffin

L. L. GRIFFIN
Chairman, ASA Subcommittee X3.2

CBI 67/1/3

**MORANDUM**

COPY

# The National Cash Register Company

ELECTRONICS DIVISION

*To* A. Hassan
*From* S. Porter
*Subject* Modification to (Proposed) ASCII
*Date* 7 September 1962

I. I propose X3.2 adopt a resolution stating it is their firm intention to submit modifications to the (proposed) (?) ) ASCII and its appendices as follows:

1. Remove the scope restriction that "collating sequence is not included", since

   a. In a practical sense it is not true

   b. The code was designed to have an adequate binary collating sequence

   c. It is desirable to have a standard sequence

   d. IBM doesn't favor the proposed ASCII.

2. State more explicitly that in a system which handles proposed ASCII a user can not count on null being passed. (i.e. the permissive "may or may not" is permissive on the system designer, not the user). since

   a. If it is required that null be passed, it loses its sole distinctive characteristic, and thus the all zeros (null) character could be used for some other function, i.e. graphic.

   b. The sole reason graphics being in the central 4 sticks, rather than either the let or right 4, (with the associated complications) is that the all 0's character was not certain to be preserved, and all 1's is delete.

   Note that there has been some confusion in this area even in X3.2, pointing up the necessity for clarification.

3. Assign a control character for backspace. This was requested by AIEE, and I consider it an important function.

COPY

Memo To A. Hassan
From S. Porter
Subject Modification to (Proposed) ASCII

4. Clarify the definition of "escape", perhaps in the following manner:

Escape directly affects only the interpretation of the character immediately following it. The affected character is interpreted in a manner not specified in this standard except that there need be no relation between a code's normal interpretation and its interpretation immediately following "escape"; for example, any code may be used for graphics or control. Another, more important, example is that escape-modified codes can be used as shifts. (For example shift to 188 A, or BCD) The shifted state may continue until a shift back or for a stated number of characters, depending on the shift code used. The escape is primarily intended for local use; if, however, general interchange use does develop it is intended that the standard will be augmented appropriately.

II. I propose that the unassigned areas should be restricted to control characters. Use of graphics here would complicate the separation of graphic and control, and would give the code the topsy-like flavor of the codes it is intended to supplant. Additional graphics should be added with an eighth bit. This would allow both more graphics and a better arrangement of them for example, lower case could be interspersed with upper.

Filed near Nov. 1962

## TO THE X3.2 COMMITTEE

SUBJECT: UNASSIGNED AREA OF ASCII

The attached paper has been mailed to you so as to allow you reading time prior to the forthcoming X3.2 meeting. Since the disposition of the unassigned areas may come to a final vote at the forthcoming meeting, you are advised to carefully consider the effect of your vote prior to the meeting. Many of us feel that we are not ready to make the final decision at this time. We would like to thank R. Muisa and A. Whitman for their assistance in preparing this paper.

E. J. Lewis

E. J. Lewis

W. H. McKenzie

W. H. McKenzie

CBI 67/1/7

# Proposal to Place Additional Controls in the Unassigned Area of ASCII (Preliminary)

## Summary

The American Standard Code for Information Interchange (ASCII) presently has twenty-eight unassigned positions in the basic 128 position set. Almost every user of information interchange equipment needs additional controls or graphics that are not presently assigned positions in the basic code. The code is particularly lacking in communication controls. If additional control codes are not put in this standard, the use of non-standard controls will flourish. Non-standard control codes have already caused problems in information interchange between systems using Fieldata code. It is hoped that ASCII will be at least as good as Fieldata in the control area.

The most popular opponent of controls in the unassigned area is the lower case alphabet. The majority of information interchange systems (e.g. teletypewriter networks, computer links, tapes, cards, etc.) do not use lower case alphabet. This paper does not oppose lower case alphabet altogether. Certain specialized networks such as for teletypesetting need lower case letters as well as other specialized characters. These special graphics can be obtained by shift out (SO) methods.

The object of this paper is to help the X3.2 committee to obtain the most efficient code for all parties concerned. The decision of what assignments should be made in the unassigned area of ASCII should not be the result of an arbitrary decision, but must be the result of a careful study of code efficiency and user priority. The impact of an inefficient code would cause information interchange to be more costly. The code, as it exists today, is a good one; it must not be spoiled by inefficient use of the unassigned area. Further study and documentation is necessary to show that we have chosen the best characters for the unassigned area.

## Discussion

The following statements represent some of the many items that should be considered before a vote is taken on controls versus lower case alphabet. Time did not permit the writers to solicit statements from all interested groups. It is requested that any such arguments be sent to E. J. Lewis so that a more thorough paper can be prepared.

1. The present code does not adequately consider the requirements of advanced high speed communication systems. Information interchange implies communications, but the present code is largely data processing oriented. We must not limit our communications requirements to those of teletypewriter systems. Such systems as automatic computer to computer interchange systems have new requirements. Since most systems that will be designed to use ASCII will use a new generation of equipment, careful analysis of future requirements must be made before conclusions and recommendations can be arrived at.

2. It has been the understanding of many people that column eight in ASCII will be entirely controls. If the present controls $Ack., Alt. Mode, Esc., and Del.) are mixed with graphics, the code will be inconvenient for system design since the zone bits (5, 6, and 7) should indicate that the character is a control or a graphic.

3. It should be noted that if both columns seven and eight are controls, it is only necessary to examine two bits (6 and 7) to detect a control character. If bits 6 and 7 are equal (both zero or both one), a control character is easily detected. It is good practice in code design to provide such conditions.

4. It is too early to take a final vote on the unassigned area. The X3.[illegible].6 and X3.3 groups and others have not completed their studies of controls sufficiently to report their findings. It is believed that additional escape type codes are necessary if we are to efficiently provide all the required controls and graphics. A number of other controls are shown on the attached list.

5. It appears that the present code does not adequately represent the requirements of the military. It has apparently been the belief of many people that ASCII will not be used to replace the present Fieldata Code. Since there is a possibility that ASCII will eventually become a military standard, it is vital that the D.O.D. Committee on Military Communications Systems Technical Standards be consulted before the basic code is completely assigned. The cost of designing new or modified military equipment will be very high if proper code characteristics are not available. The extensive experience that military people have had with advanced information interchange equipment will be of great value.

6. That certain groups need the lower case alphabet is insufficient reason for putting the alphabet into the unassigned area. Those

that actually use the lower case alphabet represent a small specialized group. Such highly specialized groups as teletypesetting would have to use another subset even if they do have lower case alphabet in the basic code. Teletypesetters need special controls as much as special graphics.

7. The alphabetic sequence is already contained in ASCII. It is inefficient to have two nearly identical alphabetic sequences in the same basic code set. A single shift character would allow long strips of lower case letters to be sent. This mode of operation is, of course, commonly used in standard typewriters where the same keys are used for both upper and lower case. Assignment of separate codes for a second case alphabet is similar to having separate sets of keys for upper and lower case letters on a typewriter.

8. There is not really adequate room for the lower case alphabet in the unassigned area if it is desired to have an internationally acceptable code. If the three Scandinavian extension characters follow the letter Z in both upper and lower case they will interfere with three graphics in column six and two controls in column eight. It should be noted that the three graphics in column six are also proposed controls in optical character recognition (OCR). If an OCR standard is anticipated on an international basis. we have a conflict that will require the use of the unassigned area. The Acknowledge (ACK) and Note 2 (Alt. Mode) are important communication codes that are needed for international interchange.

European alphabets requiring six additional characters will cause even greater problems. The four controls in column eight must not be sacrificed.

9. A certain amount of expandability and/or versatility is needed in the code at this time. Three of four characters should be reserved for special purposes. The misuse of such reserved codes should be controlled by defining their use. The object is to have a compromise with the Fieldata type unassigned codes for specific applications. This, of course, requires the use of the unassigned area.

10. Equal priority for controls and graphics is in the interest of a well-balanced code. An equal number of controls and graphics demands that columns seven and eight of the present code be assigned to controls. This philosophy is based upon the recommendation of people who have had years of code design experience.

# Control List

1. **Media Limiters**

   (Punched paper tape, mag tape, punched cards, mag card, printed tape, line printer, character printer)

   Logical Start of Medium

   Logical End of Medium

2. **Message Limiters**

   Start of Address (SOA)

   End of Address (EOA)

   Start of Message (SOM)

   End of Message (EOM)

   Start of Blockette (1-80 col. punched card COMLOGNET)

   End of Blockette

   Start of Partial Message (465L)

   End of Partial Message

   Begin Interrupt (BI)

   End Interrupt (EI)

   Initiate Rerouting (IIR)

   Klaxon Message

   Alert Message

   Last Resort (LR)

   Start of Control Block (SOCB)

   End of Control Block (EOCB)

   Control Word Follows (CWF)

Start of Data (SOD)

End of Data (EOD)

Start of Preempt

End of Preempt

Group start

Group end

3. Format Effectors

Carriage Return (CR)

Line Feed (LF)

Horizontal Tab (HT) = Skip

Vertical Tab (VT)

Form Feed (FF)

Space

Space Suppress

Backspace

Newline (CR & LF)

Halt for Overprint

Half-Line Advance

4. Device Controls

T1ON T1OFF

T2ON T2OFF

R1ON R1OFF

R2ON R2OFF

Motor on Motor off

Upper Case, Shift Out (UC, SO)

Lower Case, Shift In (LC, SI)

Bell

Alert

Coin Collect

Coin Return

Tab Set

Tab Clear

End of Form

5. Supervisory Chatter

On Hook    Off Hook

Dial Tone

Busy

Ring

Out of Order (OO)

Camp On

Null - Idle

Sync - Idle

Seizure Demand (SD)

Line Good (LG)

WRU

RU

ACK (2)

Main Alarm (MA) SAC

Error (ERR)

Repeat Request

Cancel Transmission (CANTRAN)

Bit Sync

Character Sync

Alert ACK (AA)

Answer Back (AB)

Take Over (TO)

Ready to Receive (RTR)

Not Ready to Receive (NRTR)

Ready to Transmit (RTT)

Not Ready to Transmit (NRTT)

6. Miscellaneous

Escape (several)

End of File (EOF)

End of Record (EOR)

Mode Indicator

Delete

Connections

Data Processing Group

bema

Business Equipment Manufacturers Association
235 East 42nd Street, New York 17, New York — MUrray Hill 7-5969

# ASA SUBCOMMITTEE X3.2 - CHARACTER SETS AND DATA FORMAT

## MINUTES

Meeting #24 of October 31, November 1 and 2, 1962
ASA, BEMA, New York City

## SUMMARY:

1. Working Relationships with other Groups were reviewed; communications were directed to the Joint Steering Committee on I/O media, and its Magnetic Tape Group.
2. X3.2 adopted a resolution relating to clarification of its scope to facilitate work with the I/O media Joint Task Groups.
3. The views of X3.1 and other code concerned parties were heard.
4. ISO-/ TC 97 actions were discussed, including applicability of the WGB 6 bit-set.
5. Proposed media standards were discussed, particularly those for magnetic tape.

Next meeting to be held in Philadelphia, December 5th, 6th and 7th.

R. E. UTMAN
NOV 16 1962
BEMA/DPG

NM/AH
310/4

## MINUTES OF X3.2 MEETING OF OCTOBER 31, NOVEMBER 1 - 2, 1962

0. Agenda was approved as amended and shown in Appendix A, except for item 10.3 which was added on November 12th.

1. Attendance and Membership are shown in Appendix B. D. Jarvis who is Manager of Systems, Product Planning, St. Paul Univac operations, was proposed as alternate for E. C. Clamons and remained as observer during this meeting. A letter was received from L. Bloom accepting status of consultant to X3.

2. Minutes of previous meeting. Minor changes suggested were held for consideration after October 31st, since the secretary was not present. (Minutes were approved as amended on November 2nd.)

3. Reports of Working Groups and other ASA Subcommittee Activity

   a. The Chairman, L. L. Griffin, met with X3.1 on October 24th. A resolution was passed requesting inclusion of 4 symbols in the standard code set (see App. C). Mr. C. C. Heasly of Farrington and X3.1 is to meet with X3.2 on November 2nd to discuss this matter of joint concern.

   b. R. M. Muise provided Liaison Report #3 re. Joint Task Group for I/O media on Magnetic Tape and its September 24 - 25 meeting. In response to the letter from Chairman of X3.2, dated 6 September 1962, the following resolution was adopted:

      "Current activities and intentions of the TR-27.6.3. Joint Task Group for Input/Output on Magnetic Tape are as follows:"

      1. An Electrical Standard for Magnetic Tape has been submitted to TR-27 for approval and eventual transmission to ASA. This is substantially the 1/2 inch 7 track, 200 bits per inch format. It does not contain references or recommendations for a character set, but by its design it is limited to a 6 bit character set. It is the feeling of the Task Group that if the proposed ASCII character set or another character set were to be adapted to 6 data channels, then the X3.2 Subcommittee should recommend the mode by which this should be done. The Task Group would then generate the means by which this would be transposed on the tape.

2. A complete Physical Standard for Magnetic Tape material (7 track 1/2 inch) is in draft form and is currently before the Task Group.

3. A tentative Standard Proposal for Standard Magnetic Tape based on 8 tracks on 1/2 inch tape at 200 bits per inch is before the Task Group for consideration and will implement the proposed ASCII character set.

4. The Task Group is discussing the necessity of defining an electrical interface between the tape transport and its associated equipment. So far this has not generated any great enthusiasm.

5. When the foregoing has been completed, the Task Group will proceed to generate a new standard which will be designed around the ASA character sets and which will be compatible with future expansion.

c. Punch Tape, Joint Task Group for I/O Media on, J.F. Auwaerter, X3.2 representative for this group was absent (ill). In lieu of his report, the Chairman's minutes of Executive Meeting of TR 27.6.2 were read and the attached Proposed Standard Code for One Inch Perforated Tape. (See Appendix D)

d. Punch Card, Joint Task Group on I/O Media for, L. L. Griffin reported on activities of this group. Minutes of last meeting have not yet been published. Answer to X3.2 Chairman's letter of September 6th is attached as Appendix E.

e. X.3.3 - Data Transmission Subcommittee (Liaison rep: J. B. Booth). No report at this time.

4. Report on ISO/TC-97 and W. G. Meetings.

a. W. G - D (R.E. Blue). No substantive work was accomplished. Effort was devoted to planned organization for a Joint I/O Media Working Group. Outcome was TC-97 established a joint steering committee arrangement for coordination and assigned

| | | |
|---|---|---|
| | WG-D (TC-53) (IEC), | Magnetic Tape, |
| | WG-H (TC-95) (ISO), | Punch Tape, |
| and | WG-D (TC-97) (ISO), | Punch Cards. |

b. WG-B. (L. L. Griffin)
Position of U.S. deemphasizing 6-bit set was opposed by various European countries. Germany voted "No" because of position of "Space" in 6-bit set on forwarding of Draft Proposal (on 6-bit and 7-bit sets) to TC-97. CC ITT stated that it, not ISO/TC-97, is responsible for standards in the telecommunication field.

Working Group B and E (Programming Languages) joint meeting was also described by L. L. Griffin. Discussion centered on 1) use of ESCAPE character, 2) use of "Unassigned" area.

5. Discussion of ISO/TC-97 WG-B 6-bit set
What the U.S. (X3) position should be regarding the WG-B 6-bit set was discussed. With respect to punch cards, it was deemed essential that "There should be a unique representation of each code in punch cards regardless of the size of the set." (Meeting recessed till 9:00 A.M., November 1st). A "subsidiary standard" 6-bit set (or sets) may be useful in the U.S. but the WG-B 6-bit set does not appear to be particularly attractive for this purpose in punch tape or punch cards. To the extent that there will be code sensitive transmission systems, there will be an economic advantage to having them sensitive to only one coded character set. Further consideration of this topic deferred till item 10.1 (related subsets).

6. Proposed Magnetic Tape Standard
After some consideration of the above, the obstacle to "progress" in the Joint Task Groups for I/O media became the topic of discussion. The following resolution proposed by E. Clamons, and seconded by G. Shimabukuro, was adopted with a vote of 8/0/2 (YNA).

> "X3.2 is concerned that the activities of the Joint Task Groups may be hampered since the decisions arrived at by the Joint Steering Committee on February 21, 1962, have apparently not been sufficiently disseminated, understood, and therefore implemented. It is therefore resolved that X3.2 recommends that the Joint Steering Committee review, direct and, if necessary, redirect the work programs of the Joint Task Groups (Media); specifically that the Joint Steering Committee should furnish program direction and procedures to be followed in establishing ASA media standards."

Mr. Utman reported on certain actions taken in the BEMA standards Review Board, with respect to the proposed ASCII.

Mr. R. Turner of NASA was given an opportunity to present his thoughts on ESCAPE. He favors a code of (n-1) "1"s followed by a zero for each n-bit set. He proposes further that the character following escape denote the number of bits for the upcoming set.

Item 6 was returned to at 4:40 P.M.
After considerable discussion the matter proposed was resolved by authorizing the Chairman to draft a letter to the Magnetic Tape JTG on I/O Media. This was approved on November 2nd, and appears as Appendix F. (Meeting recessed till 9:00 A.M., November 2nd).

### 7. Proposed Punch Card Specifications

Relevance of physical specification to X3.2's work was questioned. Since the proposed standard has not been transmitted officially and many members have not seen it, R. E. Blue agreed to send copies to each member. Action was tabled till next meeting.

### 8.6. Graphic Representation

Mr. C. C. Heasly of X3.1 presented their case for positions to be reserved in the standard code set for the hook, fork, step and ramp symbols used in OCR activity. (See Appendix G). The Chairman summarized ensuing discussion as follows:

> The problem is basically for the OCR group to define the control significance of character codes requested to be included in the standard. When proposed usage of requested characters is classified, decision can be made as to association with existing control codes or graphics, perhaps in unassigned area.

### 10.3 Agenda Item 10.3 was added:

"Recommendation to Joint Steering Committee on Implementation of Code Representation in I/O Media".

The following resolution was adopted:

> Resolution
> Subcommittee X3.2 proposes that its scope be suitably interpreted, or extended so as to include responsibility for the representation of codes in the several media, taking into account the need for error checking. Such interpretation is consistent with the scope of its ISO/TC-97 counterpart, Subcommittee 2. It is recognized that media present physical limitations, and that close working liaison with the Joint Task Groups (I/O Media) necessary to the conduct of X3.2 work.

(November 2)

Moved: Booth
Seconded: Kerr

Vote: Yes (9) No (0) Abstain (1)

---

The secretary was requested to furnish a list of liaison representatives from X3.2. This was done, using the 2/2/62 minutes as source. To provide an opportunity to peruse interim minutes and update the list, the matter was deferred for consideration at next meeting.

Next meeting is to be in Philadelphia on December 5, 6, and 7.

### 8.2 Shift Out/Shift In

The Chairman described the difference in European and domestic views on this matter. Europeans generally wish to use these codes for a locking shift within the basic set (e.g. (4 graphics) rather than as a locking mode shift into an alternate equi-bit set.

X3.2 believes Shift Out should be used for transfer to a character group not in the basic (e.g. 7-bit) set and remaining in that mode until the Shift In occurs. This precludes the use of SO/SI to shift within the basic (7-bit) set. Certain codes must retain the same meaning in both sets for essential control purposes. These might include for example,

Null, Shift Out, Shift In, Escape and Delete

### 8.1 Escape

Chairman quoted the definition in WG-B Document 30 (ISO Draft proposal — 6 and 7-BIT CHARACTER CODES FOR INFORMATION PROCESSING INTERCHANGE)

> "A functional character which, when inserted, may change the meaning of the next single following character.
>
> For example:
>
> The pair of characters may be interpreted as a graphic or functional character not included in the standard set; or
>
> The meaning of these two characters may be: "Go into Code X and stay in it", thus being used as a locking shift."

D. Kerr asked: Must occurrence of ESCAPE allow any codes to pass thru transmission system - must system be completely code insensitive - or can Escape be simply structured so terminal devices can reasonably monitor the transmission? H. Smith suggested escape could be defined 1) to affect only the single character following, 2) be a locking escape, 3) be escape for binary transmission (but transmissions system be responsible for return e.g. after a specific number of bits, or time period, has passed.)

L. L. Griffin presented S. Gorn's conception that escape could 1) affect next character only, 2) be controlled by next character telling number of characters in item affected, 3) affect next item only where item is determined by another control, 4) be controlled by next character indicating number of items where the item(s) are specified by another control.

Meeting was adjourned at 4:00 P.M., November 2, 1962

Minutes Submitted by A. H. Hassan

A. H. Hassan
Secretary, X3.2

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APPENDIX B

## ATTENDANCE X3.2 MEETING #24

### MEMBERS AND ALTERNATES

| | | | Oct. 31 | Nov. 1 | Nov. 2 | 1962 |
|---|---|---|---|---|---|---|
| Teletype Corp | J. F. Auwaerter | J. B. Booth | A | A | A | |
| IBM | R. E. Blue | M. J. Franklin | P | P | P | |
| UNIVAC | E. H. Clamons | *D. Jarvis | A* | PA* | PA* | |
| Bell Labs | J. F. Chesterman | | P | P | P | |
| Navy Dept. | L. L. Griffin | | P | P | P | |
| A.T.&T. | R. M. Gryb | D. A. Kerr | A | A | A | |
| N.C.R. | A. H. Hassan | S. Porter | | P | P | |
| Monroe | H. Layton | *M. Mendelsohn | P | P | P | |
| Minn-Honeywell | R. M. Muise | T. R. Bousquet | P | P | P | |
| Burroughs | P. Quantz | G. Shimabukuro | A | A | A | |
| Friden, Inc. | H. Tholstrup | | | | | |
| I.T.T. | A. Ungar | J. Trawick | P | PA | A | |
| RCA | H. Kleinberg | H. Spielman | A | A | A | |

### CONSULTANTS AND OBSERVERS

| | | | | |
|---|---|---|---|---|
| IBM | C. MacKenzie | | C | C |
| | H. J. Smith | | | C |
| NASA | R. Turner | | 0 | 0 |
| Farrington and X3.1 | C. C. Heasly | | 0 | 0 |
| BEMA | R. E. Utman | | 0 | 0 |

*Proposed

November 13, 1962

MR. K. J. AMOS, Technical Manager
Creed & Company Limited
Telegraph House
Croydon, Surrey, England

Dear Mr. Amos:

This is in response to your letter of October 30, 1962.

You asked about our current thought on the introduction of a majuscule alphabet if miniscules had been used initially, or vice versa. In particular, there appears to be an ambiguity as to whether these additional characters would be obtained through use of the unallocated block within the 7-unit framework or through use of the functions SO and SI.

The question is not really settled yet and in the final event may go either way. More work remains to be done. The significant fact, however, is that the code at present leaves room to attain a secondary alphabet by either means.

From the point of view of both international and U.S. domestic technical committees working on the coding problem there are at least three potential uses of the unallocated permutations in the 7-unit code. In the order of what I sense to be their present popularity these three uses are:

1. Lower case alphabet
2. Programming language symbols
3. Additional single-character controls

If a miniscule alphabet is placed within the 7-unit framework, the meaning of the functions SO and SI will have to be redefined, if indeed they are kept as such at all. If, however, programming language characters or controls are placed in the unallocated area, I am sure these functions will perform the case-shift operation.

CBI 67/1/7

To generalize, I would say that the maximum number of printing characters on a monocase teletypewriter would logically be 64. The possibility of a maximum of 96 being useful for general message communication arises only where a miniscule alphabet is required. I see no need to go beyond the 64 (or 96, as above) in view of the additional cost entailed. Computer programmers seem to have sufficient special symbols in the present code proposal to do the vast majority of their work. This fact was confirmed at a joint meeting of the Programming Language and Code Alphabet Committee meetings in Paris last month. Where they desired additional symbols the programmers displayed inventories so large (say 30 to 100 more characters) that general usage of the larger set appears improbable.

M. Besseyre told me that current CCITT thought was that they would require four or five codes reserved for national signs (such as ¥), and about an equal number for diacritical marks. I feel that these might be provided by symbol substitution within the present code structure without increasing the number 64 (or 96). Here again only further developments will tell the story.

Yours very truly

ORIGINAL SIGNED BY
J. E. AUWAERTER

JFA:AC

Director of Product Development

creed

COMMUNICATIONS · DATA PROCESSING · AUTOMATION

**Creed & Company Limited**
TELEGRAPH HOUSE · CROYDON · SURREY
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Telegrams Credo Telex Croydon
Telex 28836

OUR REF KJA/EMH

30th October, 1962.

11/1

Mr. J.F.Auwaerter,
Teletype Corporation,
5555 Touhy Avenue,
Skokie,
Illinois, U.S.A.

Dear Mr. Auwaerter,

I would like if I may to revert to the question of codes and alphabets.

As you are aware, this question was discussed at a Study Group 1 C.C.I.T.T. meeting recently in Geneva, in effect in preparation for joint discussions on the matter between C.C.I.T.T. and I.S.O.

From my colleague, Mr. Woodman, who was at these discussions, I gather that the American view, or at least the view expressed by Mr.Woodward of the F.C.C., differed somewhat from what I had previously understood to be the American standpoint based on the proposed codes you sent me.

Originally, from discussions with you and codes you sent, I had understood that within the 7-unit framework and allowing the eighth bit for potential future but as yet undefined requirements, blocks had been left unallocated that would permit the introduction of a majuscule alphabet if miniscules had been used initially, or vice versa, without any inversion signal. Mr.Woodward, however, was of the opinion that the functions SO and SI were intended for an inversion or shift signal to cause a change between majuscule and miniscule alphabets.

I would be grateful if you could confirm whether, in fact, Mr.Woodward had correctly interpreted the current American view and that in America you are therefore in effect considering a possible 7-unit alphabet with shift even for telecommunication machines. Moreover, on the assumption that this is so, could you also advise me what is the maximum number of printing characters and mechanical functions associated with the printing mechanism that is now being contemplated in current American thought.

Yours sincerely,

K J Amos

K.J.AMOS.
Technical Manager

# TASK GROUP X3.2.4
## ASA Sectional Committee on Computers and Information Processing Standards

REPORT

1st Meeting - December 4, 1962
Barclay Hotel, Philadelphia, Pennsylvania

ATTENDANCE:

| | |
|---|---|
| Robert E. Blue | IBM Corporation |
| Eric H. Clamons | UNIVAC - Chairman |
| H. Layton | Monroe Calculating Machine Co. |
| John L. Little | Data Processing Systems Div. |
| C. E. Mackenzie | IBM Corporation |
| L. R. Turner | Lewis Research Center, NASA |

The Task Group met for the first time to discuss the work which had been accomplished previously and to consider further action.

The concensus of the group was that the unassigned area of the 7-bit code should be "unassigned for graphics only". They are to be left open for "industry choice" assignment, specifically, the need for the lower case alphabet was expressed. Mr. John Little submitted his proposed extension of the graphic set which is appended.

Mr. Trawick, who could not be at the meeting, has requested that at least six more controls be considered for inclusion in the unassigned area. However, in the absence of Mr. Trawick or a contributary paper, the group had no choice but to declare itself uninformed.

Mr. Trawick submitted information on the MIL STD 188A INFORMATION CODE SET, THE ARMY FIELD DATA CONTROL FUNCTION CODE SET, 465L FIELD DATA CONTROL SET, and DATACOM CONTROL CODE SET. The information did not arrive in time to distribute at the meeting, but is appended for general information.

No further meetings have been scheduled.

EHC/i
December 5, 1962

Eric H. Clamons,
Chairman

NMAH
310/4

Data Processing Group

bema

Business Equipment Manufacturers Association
235 East 42nd Street, New York 17, New York — MUrray Hill 7-5969

## SUBCOMMITTEE X3.2 - CHARACTER SETS AND DATA FORMAT

## UNDER ASA SECTIONAL COMMITTEE X3-COMPUTERS AND DATA PROCESSING

### MINUTES

Meeting #25 of December 5 - 7, 1962
Marriott Motor Hotel, Philadelphia

### SUMMARY:

1. ESCAPE, Related Subsets and codes for 7 track magnetic tape were considered.
2. Action of the BEMA Standards Review Board and the role of de facto codes were discussed.
3. Resolutions were adopted relating to de facto standards and code representation in media.

Next Meeting: January 23 - 25, 1962 in New York City.

4/36
#4 [illegible]

R. E. UTMAN
DEC 26 1962
BEMA/DPG

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## MINUTES OF MEETING #25 — X3.2

R. E. UTMAN
DEC 26 1962
BEMA/DPG

(Numbering corresponds to agenda)

0. Agenda was approved as amended (Appendix A)

1. Attendance is shown in Appendix B:

D. Jarvis was accepted, by vote, as alternate member from Univac. The following were proposed as principal or alternate members as indicated by P or A respectively:

| | | | |
|---|---|---|---|
| (P) | * Monroe Weinstein | - | ITT - Information Systems |
| (A) | Leo Petrover | - | ITT - Information Systems |
| (P) | Allen Whitman | - | ITT - Communication Systems |
| (P) | R. M. Ireland | - | Kleinschmidt Division,<br>Smith Corona Marchant Corp. |

(* Not present)
Letters are to be submitted by their employers to the Chairman formally proposing their membership.

2. Minutes of previous Meeting were approved as amended. Amendments are shown as Appendix C.

VOTED: All motions that are seconded and carried or defeated shall be included in the minutes.
Motion passed with one negative vote.

Agenda was considered:

Items 7.5 and 7.6 were added. It was voted that 7.6 (BEMA Standards Review Board actions of 10/31/62) would be taken up immediately after item 3.

3. Reports of Working Groups and ASA Subcommittee Activity

a. Magnetic Tape - Joint Task Group

R. Muise had nothing to report. L. Griffin reported that MT-JTG Chairman stated that further clarification of X3.2 communication (Appendix F - X3.2 Meeting #24) was desired.

b. Paper Tape - JTG-J. F. Auwaerter reported

Proposed ASCII recording in 1" punch tape was generally acceptable. Group was to study and indicate opinions on;

1) Parity (odd or even ?)
2) Manner of representation of proposed ASCII in punched paper tape.

c. Punch Card - JTG - L. L. Griffin reported.

A working paper submitted by Mr. Griffin was discussed in the JT group. The Chairman (PC) reported that the proposed physical standard had been submitted to TR 27.

Reports on X3.3 and X3.4 were deferred.
C. MacKenzie reported on Numerical Machine Tool Control having attended a meeting on November 19 of an AIEE group concerned with it. Objective is to specify a cartridge, code and data format.

J. Auwaerter reported on a meeting of a part of the Radio Technical Commission for Aeronautics. It is desired to set broad standards for ground to air communication covering the fundamental elements of communication: coding, format, modulation, etc. It is desired also to avoid international control problems, so that aircraft passing over various countries will not be subject to varying control systems.

It was felt by some observers that the RTCA is desirous of a single standard and that as long as X3.2's effort is responsive to their needs, they will continue to plan on using the proposed ASCII.

H. Tholstrup reported that X6 will probably meet in January 1963; preparatory documents are in process now.

7.6 Discussion of BEMA Standards Review Board action on October 31, 1962

The Chairman read the motion adopted by Sectional Committee X3 on June 22, 1962.

> "Sectional Committee X3. support X3.2 Subcommittee's effort in direction of a unified standard code, which implies logically related subset (s), for information interchange"

It was pointed out by Mr. Quantz that adoption of one de facto code as a standard(for information interchange) opens the door for other de facto codes to be proposed as standards. Mr. Layton indicated the reasons for his letter proposal to X3.2 members — namely, that the disagreement evidenced in the BSRB requires reconciliation.

Meeting recessed till 8:00 A. M.; December 6th.

* * *

Further consideration of 7.6 was postponed until R. E. Utman's arrival.

Item 6: Recommendation to Joint Steering Committee on implementation of code representation in media.

Motion 6A: X3.2 believes that progress in developing media representation of the proposed ASCII will be facilitated if X3.2 makes recommendations on logical representation for use in the Joint Task Groups.
Vote: Yes (3) No (7): Motion failed.

Motion 6C: X3.2 plans to reestablish work groups to generate the methods of code representation in the various Input-Output media. Methods for code representation will be forwarded for informational purposes to the Joint Task Groups concerned.

Participation will be open to all interested groups and/or subcommittees who may wish to assist in this effort.
Vote: Yes (3), No (6): Motion failed.

Motion 6B:

X3.2 recommends that the Joint Steering Committee instruct the JTG/IO media to establish working groups. These working groups would be responsible for code (logical) representations of the proposed ASCII in media and would be directed by X3.2. Draft standards developed by these working groups would be submitted to X3.2 for processing.
Vote: Yes (10), No (0), Abstain (1) Passed.

Item 7.6 : R. E. Utman distributed copies of relevant documents identified as Appendix pages E1 thru E 8. Mr. Utman corrected a statement made at a previous X3.2 meeting regarding probable ASA procedure in event a member organization of X3 decided to submit a proposed standard without sponsor's forwarding. ASA would not send proposed standard back to sponsor (BEMA) but would hold a review by interested parties, Bema, (the sponsor), being only one of these.

In discussions with ASA, it has been learned that conflicting standards are not acceptable. ASA would not accept competing standards but would refer them back to the submitting body (i.e. X3). If a general standard (such as the proposed ASCII) were submitted and together with it, a competing, or conflicting standard showing a media code representation, ASA would be inclined to accept the general and reject the specific standard.

(These are oral answers to questions. The Letter to Mr. Gay in Appendix E is for the purpose of obtaining written answers in this area.) Greater weight would be given to general interest and users groups attitudes than to the attitudes of some manufacturers, based on economic hardship.

Mr. Utman stated that ASA would most likely ask X3's opinion as to clarification on what might be competing and conflicting standards.

> (It is generally understood that X3 and
> X3.2 have the code standard responsibility.)

It was suggested that X3.2 might, as a guide, state which codes (de facto) are in fact conflicting and competing and which are not. This would depend on where the codes were employed.

The following was voted on and passed: Yes (5), No (2), Abstain (3).

> X3.2 is of the opinion that if any existing coded character set is to be considered a de facto standard, many must be considered and that, if any one is found to be allowable jointly with the proposed ASCII, many will be found allowable. Analysis of the following documents in previous X3.2 activity supports this opinion:
>
> "A Survey of Coded Character Representation", R. W. Bemer.
>
> and "A Survey of Punched Card Codes" - H. J. Smith and F. A. Williams (Communications of ACM, pp, 638, 642, (1960).
>
> "Further Survey of Punched Card Codes" - H. McG. Ross. (Communications of ACM, pp. 182-183) (1961).

Item 3. Liaison Reports, etc., (continued)

Mr. Clamon s reported on the work of task group X3.2.4 on "unassigned" area.

X3.2 was asked to consider the results of this group's work and accept the report as terminal. The matter was deferred for the next day's session. (The report was not accepted as final).

The Chairman formed groups to be in effect for the balance of the 25th meeting with group leaders as follows to report when X3.2 reconvened on December 7.

| | Subject | Leader |
|---|---|---|
| 1. | Escape | H. Spielman |
| 2. | Related Subsets | H. Layton |
| 3. | Magnetic Tape, code(s) for | L. Griffin |

Item 3 (continued)
X3.3 Liaison - J. Booth reported.

a. Last minutes of X3.3 indicate their impression that (TC-97) S,C.2 took action to reserve two characters for Data Link Escape (this is not so.).

b. X3.2 may desire to work with X3.3 on formats for data transmission: It was noted that X3.3 should be working closely with CCITT to insure maximum compatibility internationally.

X3.4 - R. E. Utman made liaison report. Algol is being prepared for ISO processing by IFIPS. X3.4 is preparing U.S. position. Versions of Fortran and Cobol are candidates for presentation as standard languages. Impact on code sets is that if these languages become standard, additional graphics maybe desired.
APT is being specified for use in field of numerically controlled machine tools, and is being considered as a candidate for standardization.

Next meeting of X3.2 was set for January 23, 24, and 25th in New York City.

End of December 6th session.

* * *

7.5. Code Combinations for + and −

The codes for + and −, being 010 1011 and 010 1101, respectively, are dissimilar in only 2 bits. Commander Wright of the British Admiralty had mentioned this matter to the Chairman of X3.2. The matter was considered and discussed but there was not found to be justification for change in the proposed ASCII.

Reports of ad hoc working groups:

7.4. Magnetic Tape Group - L. Griffin reported that no agreed conclusions were reached.

4.1 ESCAPE - H. Spielman delegated to D. Kerr the task of relating the essence of the group's discussion. A concept of reserving SO, SI for permanent (till return signaled) escape to another set was presented, the basic escape code (∃) being used primarily to establish additional control codes. The occurrence of any code in a major group (e.g. the central 4 "Sticks") would terminate the escape sequence. (Shift In would always mean return, or remain, in the "normal" set.) Any code would have its normal meaning after the escape character pair.

7.1 Related Subsets - H. Layton reported that agreement had been achieved on definition of Scope and a Work Program to be carried out by a continued task group.

Scope: To determine, by investigation, if there is a need for subsets (i.e. sets with fewer than 7 bits) simply related to the proposed ASCII and make appropriate recommendations to the X3.2 Subcommittee.

Work Program: Investigate context of the requirements for 4, 5, and 6-bit subsets in various user applications, considering the characteristics of the following:

1. a. Input Output Devices (human input speed limited and faster)
   b. Central Processing Units
   and c. System Factors as implied, for example, by (transmission facilities, process control, etc.).

2. Define applicable subsets, if any.

3. Indicate method of translation to and from proposed ASCII.

4. Consider, and recommend on, representation of such subsets in I/O media.

---

The question of establishing such a work group was deferred till the next meeting.

The temporary work groups are still to be in effect when X3.2 reconvenes at the next meeting.

Liaison representatives from X3.2 are currently as follows:

| | | |
|---|---|---|
| To: | X3 - IAC | J. Auwaerter |
| | X4 | H. Layton |
| | X6 | H. Tholstrup |
| | X3.1 | L. Griffin |
| | X3.3 | J. Booth |
| | X3.4 | R. Utman |
| | X3.5 | A. Whitman |
| | X3.6 | P. Quantz |
| | X3.7 | none |
| JTG's | Magnetic Tape | R. Muise |
| | Punch Tape | J. Auwaerter |
| | Punch Cards | L. Griffin |

Meeting was adjourned at 3:00 P.M., December 7th.

A. H. Hassan

A. H. Hassan,
Secretary

**underwood** *Corporation, New York, N. Y.*

*One Park Avenue*
*New York 16, New York*
*Telephone ORegon 9 3400*

December 21, 1962

Mr. Vincent Grey
American Standards Association
10 East 40th Street
New York 16, N. Y.

Dear Vince:

Underwood Corporation strongly favors the adoption of the proposed American Standard Code for Information Interchange, as approved by the A.S.A. X3 Sectional Committee, as it is considered a unique and beneficial standard proposal. It is realized that this proposed standard has not as yet been submitted to A.S.A. for its consideration by the Sponsor, the Business Equipment Manufacturers Association.

It is our understanding that proposals have been made of late to the effect that one or more "de facto code standards" be submitted concurrently with the X3 proposed American Code for Information Interchange for approval as American standards.

It is our Corporate opinion that the adoption of multiple standards based on the inclusion of one or more "de facto" codes is completely unrealistic from both a technical and commercial viewpoint. It is also felt that the adoption as "standard" of a number of more or less technically unrelated codes would serve only to continue the present confusion in the area of information interchange among systems and equipments.

On the other hand, it is also our feeling that if one or more "de facto code standards" are to be considered in conjunction with the pASCII, all such "de facto codes" should receive similar evaluation. Consequently, we respectfully wish to submit a "Proposed American Standard Six-Bit Information Interchange Code for Punched Tape and Associated Equipments", copies of which are enclosed. We are submitting this proposed standard through your offices as our Company is not represented on the X3 Sectional Committee or on the X3.2 Subcommittee.

CBI 67/1/67

We wish to emphasize that our proposed standard is offered only as another "de facto standard" covering equipment currently in general use. Consideration of it is requested only if one or more other so-called "de facto code standards" are to be concurrently submitted with the X3 proposed American Code for Information Interchange to the American Standards Association for approval as American standards.

To facilitate distribution of this proposed standard, I have taken the liberty of sending information copies to those indicated in this letter.

Thank you for your assistance in this matter.

Sincerely,

James Vincent

JV:ej
Attach.

James Vincent
Director, Marketing
Research & Development

cc: Chairman, X3 Sectional Committee
Chairman, X4 Sectional Committee
Director, Office Machines Group, Business Equipment Manufacturers Association
Director of Standards, Data Processing Group, Business Equipment Manufacturers Association
Chairman, X3.2 Subcommittee, X3 Sectional Committee

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Director, Office Machines Group, Business Equipment Manufacturers Association
Director of Standards, Data Processing Group, Business Equipment Manufacturers Association
Chairman, X3.2 Subcommittee, X3 Sectional Committee

# PROPOSED AMERICAN STANDARD SIX-BIT INFORMATION INTERCHANGE CODE FOR PUNCHED TAPE AND ASSOCIATED EQUIPMENTS

# FOREWORD

The attached "Proposed American Standard Six-Bit Information Interchange Code for Punched Tape and Associated Equipments" is submitted as a "de facto standard" covering equipment currently in general use.

This proposal as submitted contains 52 commonly used graphics and controls and their existing binary representation. Eleven of the remaining 12 coded positions are available to be assigned at the convenience of users and manufacturers.

The 64th position, which is 000000, is a non-valid position.

The Appendix illustrates the coded representation of the proposed standard as used by existing tape punching office machines and as utilized by tape-to-card converters, tape-to-tape converters, and data transmission equipments.

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| 2. | Standard Code |
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| 5. | Qualifications |
| 6. | Appendix |

# PROPOSED AMERICAN STANDARD SIX-BIT INFORMATION INTERCHANGE CODE FOR PUNCHED TAPE AND ASSOCIATED EQUIPMENTS

## 1. Scope:

This 6-bit coded character set is to be used for the interchange of business data, via punched tape and associated equipments.

## 2. Standard:

| $b_6$ | | | | 0 | 0 | 1 | 1 |
|---|---|---|---|---|---|---|---|
| $b_5$ | | | | 0 | 1 | 0 | 1 |
| $b_4$ | $b_3$ | $b_2$ | $b_1$ | | | | |
| 0 | 0 | 0 | 0 | ① | ② | ② | ② |
| 0 | 0 | 0 | 1 | o | SPACE | ② | ② |
| 0 | 0 | 1 | 0 | 9 | I | R | Z |
| 0 | 0 | 1 | 1 | 8 | H | Q | Y |
| 0 | 1 | 0 | 0 | 3 | C | L | T |
| 0 | 1 | 0 | 1 | 7 | G | P | X |
| 0 | 1 | 1 | 0 | 6 | F | O | W |
| 0 | 1 | 1 | 1 | CL3A | CL4A | CL3R | CL4R |
| 1 | 0 | 0 | 0 | 2 | B | K | S |
| 1 | 0 | 0 | 1 | 1 | A | J | ② |
| 1 | 0 | 1 | 0 | 5 | E | N | V |
| 1 | 0 | 1 | 1 | EN | EA | ② | ② |
| 1 | 1 | 0 | 0 | 4 | D | M | U |
| 1 | 1 | 0 | 1 | • | ② | ② | ② |
| 1 | 1 | 1 | 0 | CZA | CZB | CZC | CZD |
| 1 | 1 | 1 | 1 | CL1A | CL2A | CL1R | CL2R |

## 3. Positional Order and Notation:

Standard 6-bit code positional order and notation are shown below with $b_6$ the high-order, and $b_1$ the low-order bit positions.

Example - The code for "R" is:

| $b_6$ | $b_5$ | $b_4$ | $b_3$ | $b_2$ | $b_1$ |
|---|---|---|---|---|---|
| 1 | 0 | 0 | 0 | 1 | 0 |

## 4. Legend

| | |
|---|---|
| ① | Non-Valid Code |
| c | Numeral |
| CL3A | Data Delimiter (*) |
| EN | Numeric Error Control |
| CZA | Data Delimiter (**) |
| CL1A | Data Delimiter (*) |
| ② | Unassigned |
| SPACE | Word Separator (Normally Non-Printing) |
| CL4A | Data Delimiter (*) |
| EA | Alpha Error Control |
| CZB | Data Delimiter (**) |
| CL2A | Data Delimiter (*) |

| | |
|---|---|
| 0 | Letter |
| CL3R | Data Delimiter (*) |
| CZC | Data Delimiter (**) |
| CL1R | Data Delimiter (*) |
| CL4R | Data Delimiter (*) |
| CZD | Data Delimiter (**) |
| CL2R | Data Delimiter (*) |

NOTE * CL Data Delimiter (Format Indicator)

NOTE ** CZ Data Delimiter (Zone or Field Indicator)

5. Qualifications:

A1. The coded charter set does not contain a parity bit.

A2. Unassigned codes may be variously assigned for the convenience of users and manufacturers.

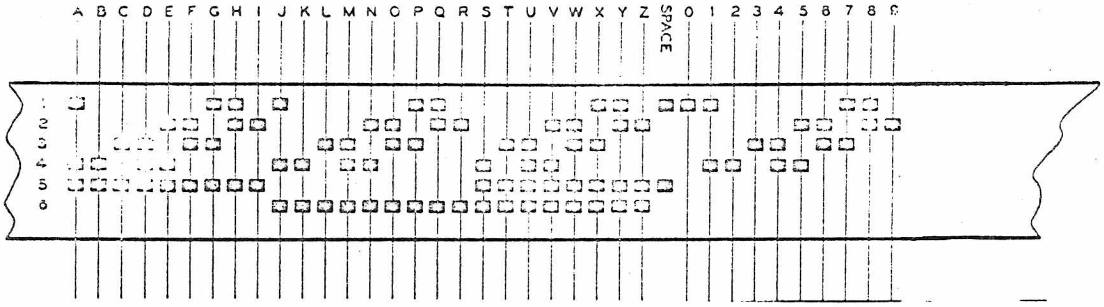
A3. This standard is presented with an Appendix which illustrates the code representation as used by existing tape punching office machines and as utilized by tape-to-card converters, tape-to-tape converters, and data transmission equipments.

A4. It is not intended to establish any standardized font designs from the graphic representations shown.

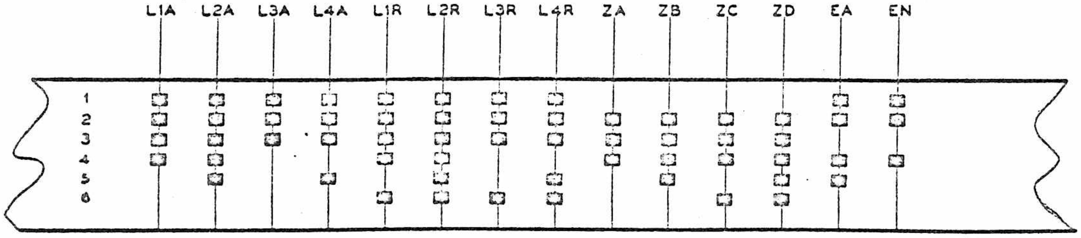
## 6. Appendix

A Coded Representation of Proposed Standard in Punched Tape.

INFORMATION CODES


A B C D E F G H I J K L M N O P Q R S T U V W X Y Z SPACE 0 1 2 3 4 5 6 7 8 9
1
2
3
4
5
6

CONTROL CODES



# REPORT

## ON THE ACTIVITIES OF

# THE INTERNATIONAL TELECOMMUNICATION UNION

in

## 1962

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Published by the
INTERNATIONAL TELECOMMUNICATION UNION
GENEVA, 1963

d) *Other activities of the C.C.I.R. Secretariat*

As in past years, the Director and Vice-Director have devoted considerable time to the work of various I.T.U. Committees, such as the Coordination Committee, Purchasing Committee, Pension Fund Management Board, etc.

Close contact has also been maintained by the technical staff with other international organizations, such as the I.E.C., the U.R.S.I., the E.B.U., the I.B.T.O., etc., whose work is linked to that of the C.C.I.R., and many meetings of such organizations have been attended.

e) *Relationship between the various organs of the C.C.I.R.*

To facilitate comprehension of the structure of the C.C.I.R. an organigram showing the relations between the various organs of the C.C.I.R., i.e., the Plenary Assembly, the Study Groups and their Sub-Groups and the Specialized Secretariat, together with an indication of their relation to the C.C.I.T.T., will be found in Annex 8 to this Report.

## 6.6 ACTIVITIES OF THE INTERNATIONAL TELEGRAPH AND TELEPHONE CONSULTATIVE COMMITTEE (C.C.I.T.T.)

### 6.6.1 *Participation in the work of the C.C.I.T.T.*

From now on the administrations of all the Members and Associate Members of the Union are taking part in the work of the C.C.I.T.T. The number of recognized private operating agencies participating rose frome 22 in 1961 to 23 in 1962; the number of industrial organizations rose from 33 to 48.

By the end of 1962, the number of rapporteurs for the 24 C.C.I.T.T. Study Groups and Sub-Study Groups was 3,724 compared with 3,150 at the end of 1961.

### 6.6.2 *Activities of the Study Groups*

For the C.C.I.T.T., 1962 was a year of intense activity by the study groups. All in all, there were three hundred and one days of meeting—a record. The salient results achieved are indicated below.

The telegraph Study Groups embarked on standardization of message retransmission (message switching) systems and synchronous telegraphy systems, with an eye to telex and gentex intercontinental services. They laid a foundation for a world-wide automatic telex plan. Study of a new telegraph alphabet was begun, with particular reference to the rapid progress being made with data transmission.

The Study Groups on transmission problems continued their inquiries into desirable characteristics for world-wide communications using submarine telephone cables. They tackled this matter in connection with satellite communication systems, with especial reference to noise objectives and transmission time.

The Study Groups on switching, signalling, and operating problems also devoted most of their time to semi-automatic or automatic intercontinental operation. Pending the production of a new system of signalling between recorders, they considered how an interim system might be evolved and improved with time. Preliminary plans were evolved for world-wide numbering and routing systems with a view to automatic working, and fresh instructions were drafted, defining how the inter-continental service should be run.

As far as rates were concerned, the standardization of the principles governing lease of circuits was carried further.

The Plan Sub-Committee for Africa sat in 1962 for the first time, and achieved promising results. Because of events in Cuba, a similar meeting for Latin America, which was to have met in Bogotá, had to be postponed until 1963. The Regional Plan meetings took up the study of technical, operating, and tariff questions raised by the " new or developing " countries, in accordance with the instructions given by the Second Plenary Assembly of the C.C.I.T.T. and by the Administrative Council.

Lastly, further to No. 179 of the International Telecommunication Convention (Geneva, 1959), study of national telecommunication problems was begun at the request of the countries concerned. Thus it was that a working party set up by the Second Plenary Assembly continued its work on a handbook, for use in the " new or developing " countries, about the planning of national automatic networks.

### 6.6.3 *Publication of C.C.I.T.T. documents*

The publication of the results of the IInd C.C.I.T.T. Plenary Assembly (New Delhi, 1960) was completed in 1962.

## 6.7 TECHNICAL COOPERATION

### 6.7.1 *General*

The view expressed at the end of 1961, that the Technical Cooperation activities of the Union would continue to expand in the coming years, was confirmed by the developments during the year under report. As the EPTA programme for 1962 was the second half of that for the biennium 1961/62 approved by the General Assembly in 1960, there was a significant increase in the number of applications for assistance under the contingency authority of the Executive Chairman of the Technical Assistance Board. The number of Special Fund projects approved rose to seven and field operations had been commenced on six of them. The experience gained in 1961 in the effectiveness of seminars as a means of providing Technical Assistance in kind to new or developing countries, resulted in the holding in Paris of a second seminar, intended specially for the newly independent French-speaking countries of Africa. Applications for assistance under the Funds-in-Trust scheme also showed an increase.

This expansion of the activities necessitated the maintenance of close contacts between the Headquarters and the various field missions and Member administrations. Nineteen countries were visited during the year by the Secretary-General or by Headquarters staff. The personal discussions with the government officials of the countries visited and in those en route, helped them to understand the procedures of the different programmes and the possibilities of obtaining help through them. As a result, more and more Members were beginning to require the advice and guidance of the Union to secure assistance for improving or expanding their telecommunication systems.

### 6.7.2 *Expanded Programme of Technical Assistance*

The year 1962 was the second half of the first biennial programme established according to the decisions of the Economic and Social Council in its Resolution 785 (XXX) of July 1960. Therefore, it provided an opportunity to review the effects of two-year programming compared to that of the annual system that had been in operation earlier. Experience during the year showed clearly the advantages of the inherent flexibility built into biennial programming. Thus a number of missions of one year's duration, which would have been fulfilled only in part within the programme year under the previous system could be completed in full because the twelve months' duration could be spread over the years 1961 and 1962. The receiving countries also